Railway Engineering Maintenance

AUGUST, 1945

ME AND TEN MILLION BUDDIES GOTTA BE ROLLIN' WEST

We have finished with the war on one front and want to get through with the war against the Nips as soon as we can. A lot of us will be going home for a few days and then rollin' West. Please help us make the most of our furloughs before we head for the Pacific by keeping your railroad travel to a minimum and only for essential business. Me and my ten million buddies will thank you.

"Edgemark of Quality"

RELIANCE HY-PRESSURE HY-CROME SPRING WASHERS

Reliance Hy-Pressure Hy-Crome Spring Washers are still doing their bit in keeping railway joint bolts tight and under constant tension by automatic compensation for inevitable looseness resulting from wear. Thus they are keeping track maintenance to a minimum and helping to keep war freight moving to the Pacific theater of war faster.

EATON

EATON MANUFACTURING COMPANY

OFFICES AND PLANTS **MASSILLON, OHIO**

Reliance Division

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

Published monthly by Simmons Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscrition price: United States and Possessions, and Canada, $3.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

TRACTORS TAKE 'EM AS THEY COME

Allis-Chalmers Diesel tractors quickly go where there is work to be done — are easy to move by flat car, trailer or under their own power. Go into action immediately — with auxiliary equipment mounted or attached they are always ready to take on any job, any time, anywhere, Working free of the tracks, they stay on the job—no interference with traffic.

Tractor power is flexible power! It is the answer to the problem of right-of-way maintenance and construction without upsetting traffic schedules . . . the answer to getting a job done when you want it done and at lowest cost. It will pay you to investigate.

• •

Today the fast, husky HD-7 is grading ditches, shoulders, slopes . . . tomorrow it is miles away moving cars or repairing another track bed and right-of-way. Popular size with railroads, this 60 drawbar h.p. Diesel tractor is now available in greater quantity for essential users.

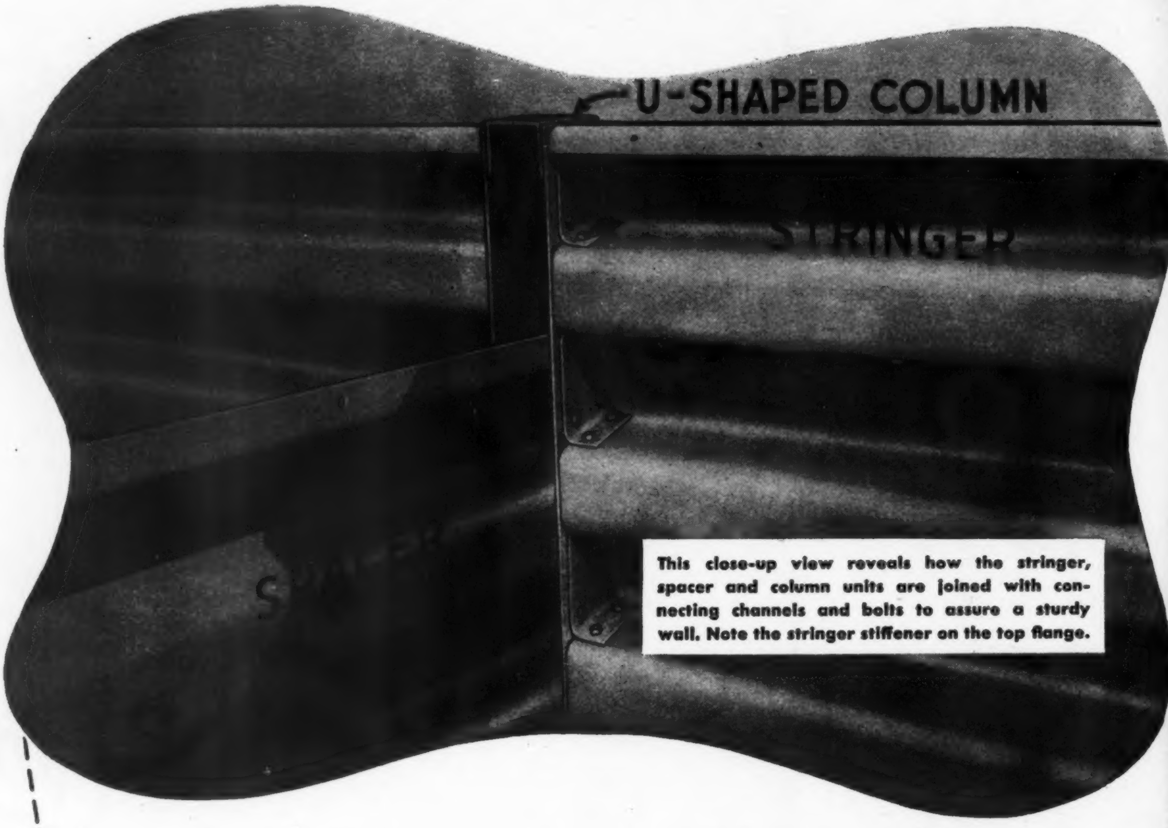
ON-THE-JOB SERVICE

Near you is an Allis-Chalmers dealer ready to provide A-1 service — locations indicated on map.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.


THE NEW
BARCO
UNIT
TYTAMPER
BARCO MFG CO
CHICAGO
For smoother tamping in congested traffic areas...
Whether a man works alone or in a gang, he does a better rail tamping job when armed with a rugged new Barco Unit Tytamper. Light, self-contained, powerful, the new Barco works easily, quickly, economically. Attached ignition system makes it handier than ever in congested traffic, crowded gangs.
Free Enterprise — The Cornerstone of American Prosperity



This close-up view reveals how the stringer, spacer and column units are joined with connecting channels and bolts to assure a sturdy wall. Note the stringer stiffener on the top flange.

STEEL WALLS THAT *TAKE THE "BITE"* OUT OF EROSION

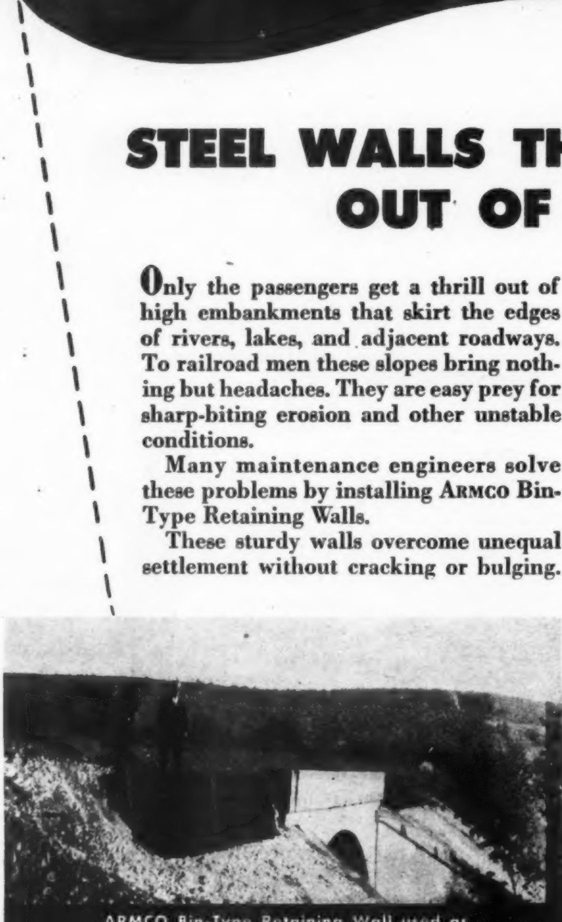
Only the passengers get a thrill out of high embankments that skirt the edges of rivers, lakes, and adjacent roadways. To railroad men these slopes bring nothing but headaches. They are easy prey for sharp-biting erosion and other unstable conditions.

Many maintenance engineers solve these problems by installing ARMCO Bin-Type Retaining Walls.

These sturdy walls overcome unequal settlement without cracking or bulging. They are so easy to erect that unskilled men can do it in any season, with less excavating. Backfilling is done as the work progresses, to prevent undermining during construction.

Economy and efficiency go hand-in-hand. Closed bin construction prevents loss of material from individual cells. ARMCO Bin-Type Walls can be salvaged for use elsewhere or changed to meet other conditions in the same location.

Get all the facts about ARMCO Retaining Walls. You'll find them a money-saving remedy for war-beaten roadbeds. Write Armco Railroad Sales Co. Inc., 2641 Curtis Street, Middletown, Ohio.


ARMCO Bin-Type Retaining Wall used as headwall extensions on a large culvert.

ARMCO

ARMCO BIN-TYPE RETAINING WALLS

Quick FLOOR...

INSTANTLY ... PERMANENTLY REPAIRS FLOOR SURFACE DEFECTS

ENEMY TO LOST MOTION

READY-MIXED ... EASILY LAID

Quick-Floor makes a smooth, long-lasting, heavy-duty traffic floor patch in one minute without interrupting or re-routing traffic. It repairs cracks, spalls, chuck holes and worn spots in all industrial floors of concrete, metal, etc.

Quick-floor smooths grades, ramps, curves, and all abrupt floor changes which cause hard pulling, jarring and upsetting of heavy loads on small-wheeled trucks. Often saves complete cost at trifling repair expense.

So simple are repairs made with Quick-Floor that anyone can do it. Satisfaction guaranteed.

Dura-Tred floor engineering service is freely available to anyone having a special floor-surfacing problem. Write for Bulletin and prices today.

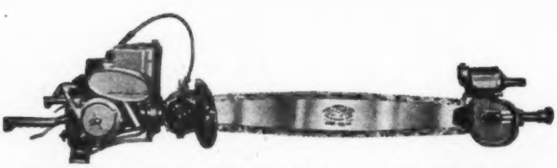
Extra heavy wire cleaning brush and Iron Tamper supplied FREE with first 55 gallon order.

DURA-TRED COMPANY 355 N. CENTRAL PARK BLVD. CHICAGO 24, ILLINOIS

THEY CAN DO SEVERAL TIMES AS MUCH WORK AS CROSS-CUT SAWS

ESTABLISHED 1840
REG. U.S. PAT. OFF.

DISSTON CHAIN SAWS



DISSTON CHAIN SAW *with Mercury Gasoline Engine*
Model G-26—6H.P., 24" capacity. Model G-36—6H.P., 36" capacity
Model G-46—6 H.P., 48" capacity.

DISSTON CHAIN SAW—***Pneumatic***
Model P-27—3½ H.P., 90 cu. ft. at 90 lbs. pressure, 24" capacity.

This is one of the fastest and most efficient cutting tools that Disston ever made. On railroad maintenance work, on new construction, wherever there are heavy timbers to cut, Disston Chain-Saws are speeding up work, reducing costs, and enabling workers to do several times the amount of cutting that can be done with cross-cut saws.

The high quality of Disston Chain Saws has been fully tested and proved on numerous operations in the timberlands, at the battle fronts, and on railroads for scores of different jobs. Their simple design and sturdy construction assure long life. Their light weight makes them as portable as any other tools. Operation is easy and can be learned quickly.

There are two types of Disston Chain Saws—with Mercury Gasoline Engine, and with pneumatic drive. Each is designed for both horizontal and vertical cutting, and can be used successfully on woods of every kind.

Disston Chain Saws are *available now.* Write for full particulars.

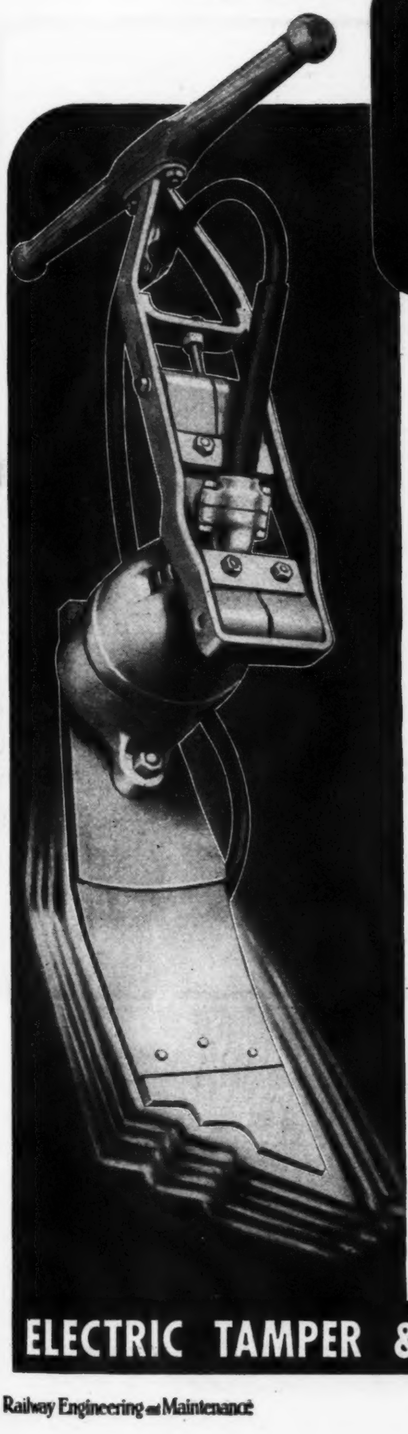
HENRY DISSTON & SONS, INC., 841 Tacony, Philadelphia 35, Pa., U. S. A.

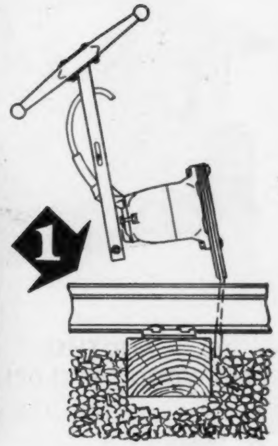
A 3-SPOT "QUICKY"

that discloses why Ballast can be placed Quicker and Better

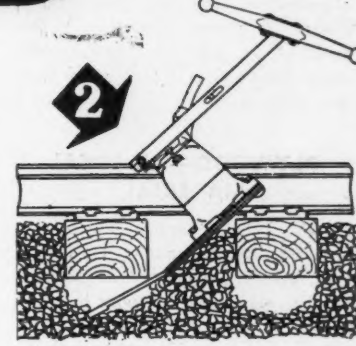
with

JACKSON VIBRATORY Tampers

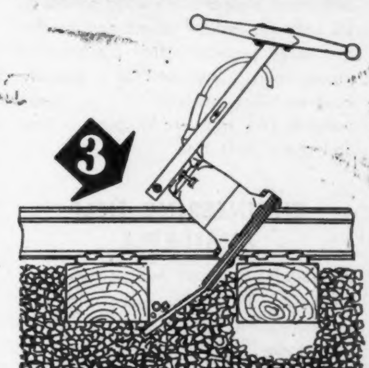




1. From a vertical position, penetration to the pocket below the tie is accomplished in a jiffy by tilting the Jackson Tamper so that the corner of the tip can utilize the sidewise and, in this position, "chopping" action of the blade.



2. Inclined back from the tie and moved from side to side, the vibratory action of the blade quickly opens a wide opening for the access of new ballast.



3. The sidewise vibratory action of the blade keeps the surrounding new ballast constantly in motion, feeding it to the end of the blade where it is firmly consolidated with the already compacted or tamped ballast by the forward vibratory blows.

The result, in ballasts of all types, is a smoother, more densely compacted tie-bed than can be accomplished by any other method — done with remarkable speed — with no crushed ballast, no unfilled holes. And that in brief, is the reason Jackson Tampers are first choice with the majority of American railroads. Write for literature completely describing Jackson Tampers and Power Units and how to use them.

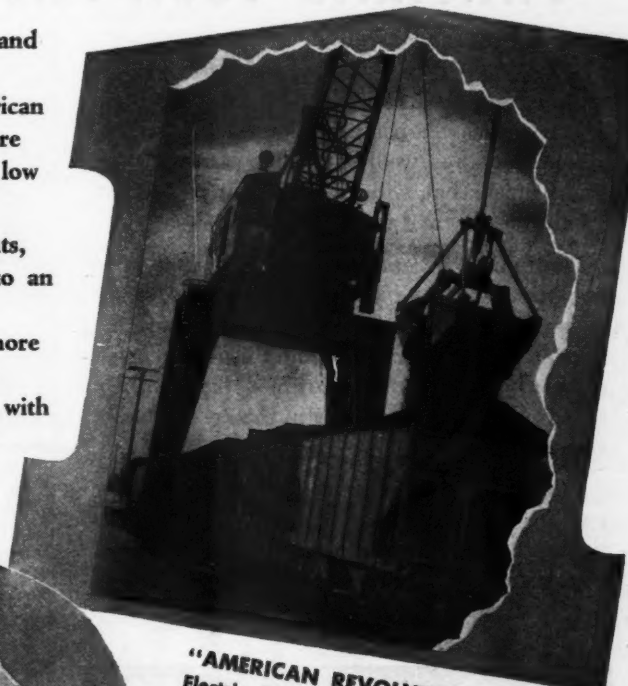
ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICH.

WHICH DO YOU NEED?

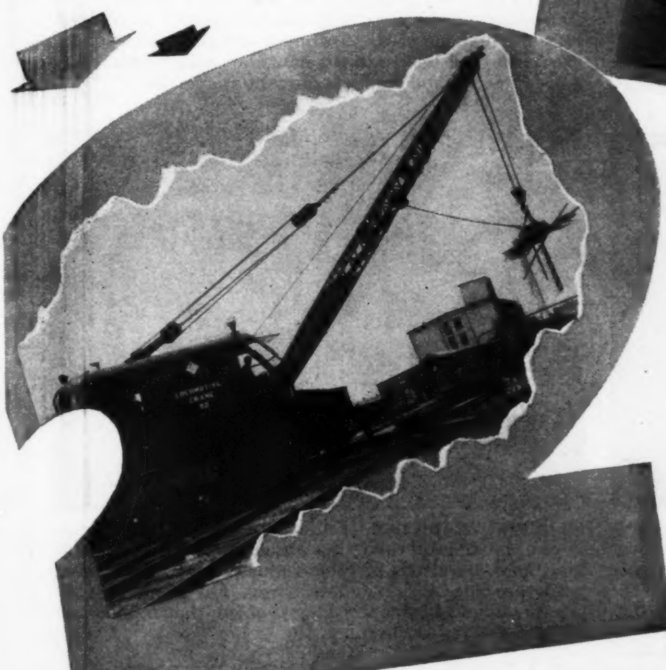
• "American Revolver" cranes offer a new and practical application to materials handling for yards and docks. It is an efficient, flexible, low operating cost application that pays off the cost of the equipment—many times over.

"American" Locomotive Cranes also offer new and practical applications of higher performance efficiency, wherever they are used. And like "American Revolvers," "American" Locomotive Cranes more than pay for themselves in the efficient, flexible, low cost operation they deliver.

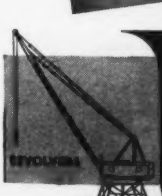
Offering both of these outstanding developments, "American" engineers have the best answers to an extremely wide range of requirements. So, whether you are concerned with the need for more handling capacity or the obsolescence of your present equipment, talk over your requirements with us now. Write, phone or telegraph for further information or an engineer's call.



"AMERICAN REVOLVERS"
Electric, Diesel or gasoline powered. Capacities, boom lengths, portal sections to suit your materials yard or dockside requirements. Machinery decks can be mounted as trolleys to extend service areas. Can also be equipped with car pullers.



"AMERICAN" LOCOMOTIVE CRANES
Each type is engineered from the rails up to suit its particular power plant—Diesel, Diesel-electric and gasoline models are not mere adaptations of the original steam model. All have air controls and comfortable cabs that eliminate operator fatigue.



AMERICAN
HOIST & DERRICK CO.

St. Paul 1, Minnesota

CHICAGO · SAN FRANCISCO · NEW YORK

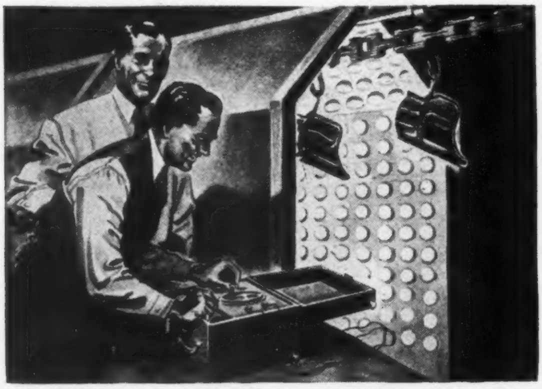
PLAN WITH DU PONT TODAY FOR FINISHING YOUR PRODUCT TOMORROW

Today's war needs still get first call at Du Pont. But if you have a peacetime product in the development stage, we'll be glad to plan with you for a finish that will give superior protection, greater beauty and top sales appeal.

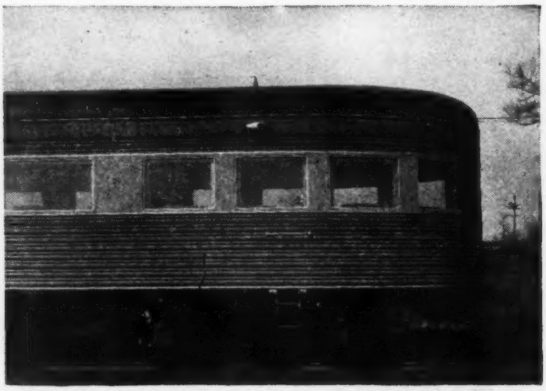
Du Pont laboratories—the same that gave you DUCO and DULUX—have been busy formulating new wartime finishes to keep finishing lines at peak production. From this research will come the finishes of tomorrow—that will help rate your product a winner in the great market ahead.

Whatever your finishing problems—whether you are turning out the tools of war or anticipating the products of peace—see Du Pont first. Our years of experience and practical "know-how" can save you time, trial and money.

IMPROVING ON NATURE—For many years, Far Eastern jungles were the only source of the resin used in high-grade varnishes and enamels. But in 1929, Du Pont Research developed a synthetic product, better by far than its equatorial cousin. This man-made vehicle added toughness and elasticity to the desirable qualities of hardness and high gloss. Its first important use was in DULUX, the finish that has since set new standards in durability and protection for products of many industries.



NURSEMAID TO A BAKING OVEN—Finishing of air deflectors was bogging down production in an important war plant. An emergency call brought a Du Pont Finishes Engineer. After measuring temperature variations of the metal as it passed through the baking oven, he recommended a change in the finish formula. Result: Conveyor speed increased from 4 to 9 feet per minute; bottleneck eliminated—a typical demonstration of the Du Pont Finishes Service available upon your call.



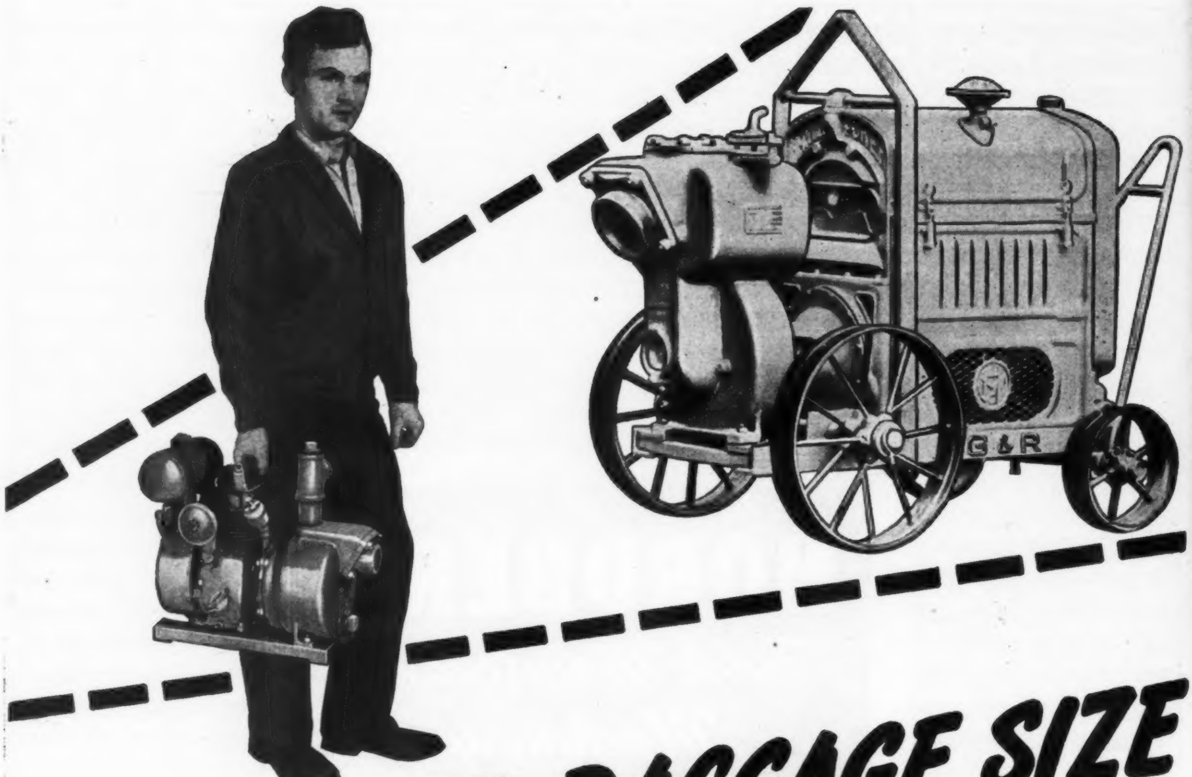
WEAR AND WEATHERING of railway equipment makes finishes of proved durability an absolute requirement. And here, as in hundreds of other industries where finishing needs are specialized and exacting, Du Pont has the answer. If you have a finishing problem that needs competent handling, write to:

E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Wilmington 98, Delaware.

DEPEND ON DU PONT FOR BETTER FINISHES

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



FROM HAND-BAGGAGE SIZE . . . ON UP!

GORMAN-RUPP PUMPS WILL FIT YOUR JOB

You may want a pump as small and easy to carry as a bag of tools – Gorman-Rupp has such a pump that will deliver as much as 3,000 gallons per hour. Or, you may have a heavy de-watering job that calls for as much as 125,000 gallons per hour at continuous operation. Whatever the size or application – get one of those dependable, Gorman-Rupp BLUE pumps!

If you want a self-priming, centrifugal pump that never has to be shut down to be cleaned out get a dependable Gorman-Rupp BLUE pump, which has no recirculation orifice to get plugged or control valve to get jammed.

For size, for weight, for power, for cost – Gorman-Rupp self-priming centrifugal pumps can't be matched! Our nearest distributor will send you one and let you be the judge. If it doesn't do a better pump job than any other you have seen, return it at our expense – and it won't cost you a cent!

GORMAN-RUPP PUMPS
UNSURPASSED FOR PUMPING FAST
ARMY E NAVY

THE GORMAN-RUPP COMPANY

MANSFIELD · OHIO

Today... more than ever before...

you need this protection!

ADDED LOADS, increased mileage and fewer replacements make it vital to protect your rolling stock these days.

That's why it will pay you so well to take advantage of the protection against wear, abrasion and corrosion offered by Flintkote Car Cements.

They come in spray or trowel consistencies ... are easily applied ... and meet the most rigorous railroad specifications.

Here are some of the places they can safeguard your precious equipment: On box cars—outside roof ... ends (side and end posts) ... over coupler units at each end of floor line ... inside, under wood lining (ends, sides and roof). Gondola Cars—over coupler units at each end of floor line ... on underframes. Hopper Cars—underside of slope sheet ... underframes ... couplers.

Please write our Railway Department for full information. And this Department will gladly work with you on any special problems.

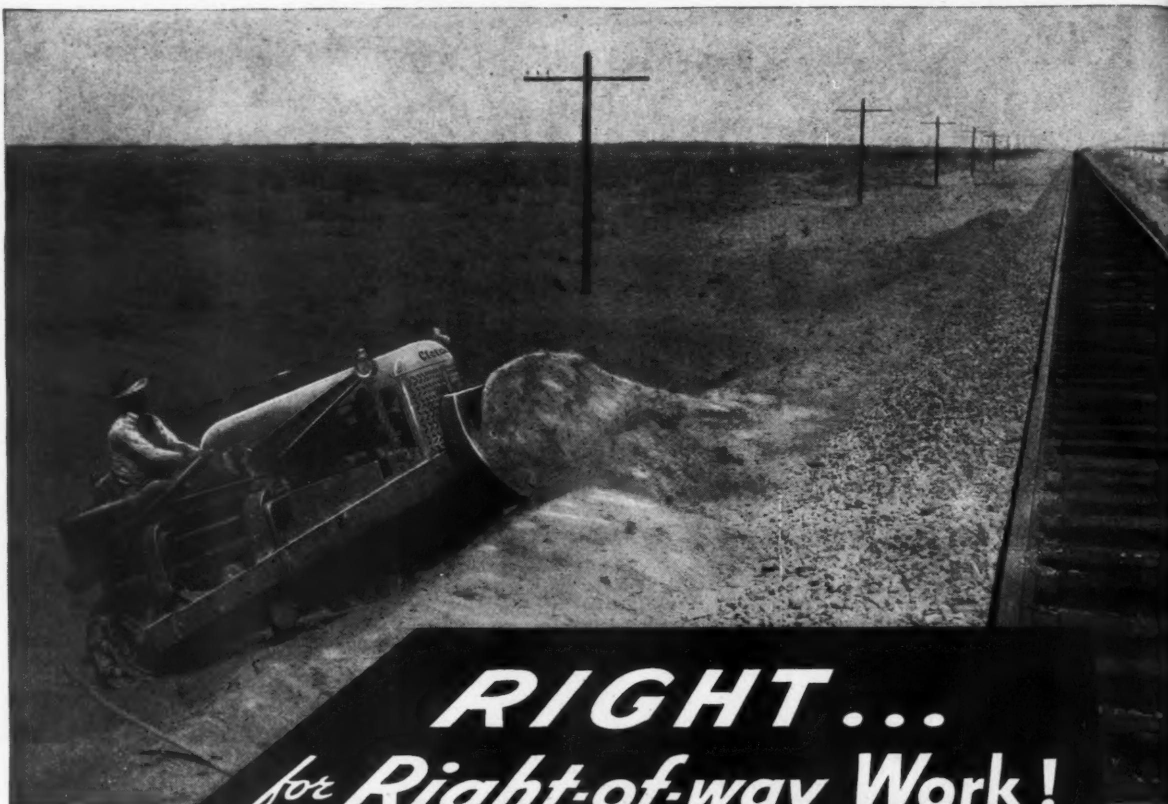
FLINTKOTE RAILROAD PRODUCTS—Adhesives • Asphalt Protective Coatings • Building Materials • Car Cements • Cold Mastic Flooring • Insulation Coating • Stock Car Flooring • Waterproofing and Dampproofing Materials

The Flintkote Company... 30 Rockefeller Plaza, New York 20, N.Y.

Industrial Products Division

ATLANTA • BOSTON • CHICAGO HEIGHTS • DETROIT • LOS ANGELES
NEW ORLEANS • WASHINGTON • TORONTO • MONTREAL

FLINTKOTE INDUSTRIAL PRODUCTS



RIGHT . . . for Right-of-way Work!

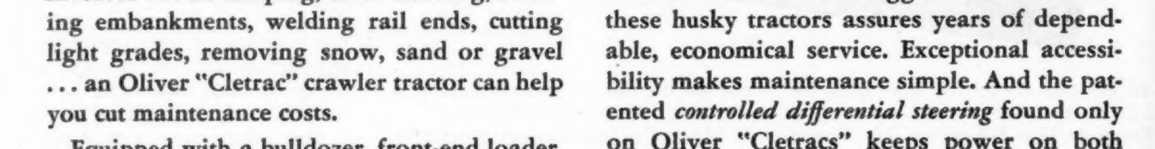
No matter what your maintenance of way work involves . . . tie-tamping, ditch cleaning, building embankments, welding rail ends, cutting light grades, removing snow, sand or gravel . . . an Oliver "Cletrac" crawler tractor can help you cut maintenance costs.

Equipped with a bulldozer, front-end loader, welder, air compressor or other types of auxiliary equipment, an Oliver "Cletrac" works "off-track" . . . does not disrupt rail traffic. Its sure-footed grousers permit it to climb over rails and to operate efficiently on muddy or icy ground. It is not dependent on tracks and needs no derailing.

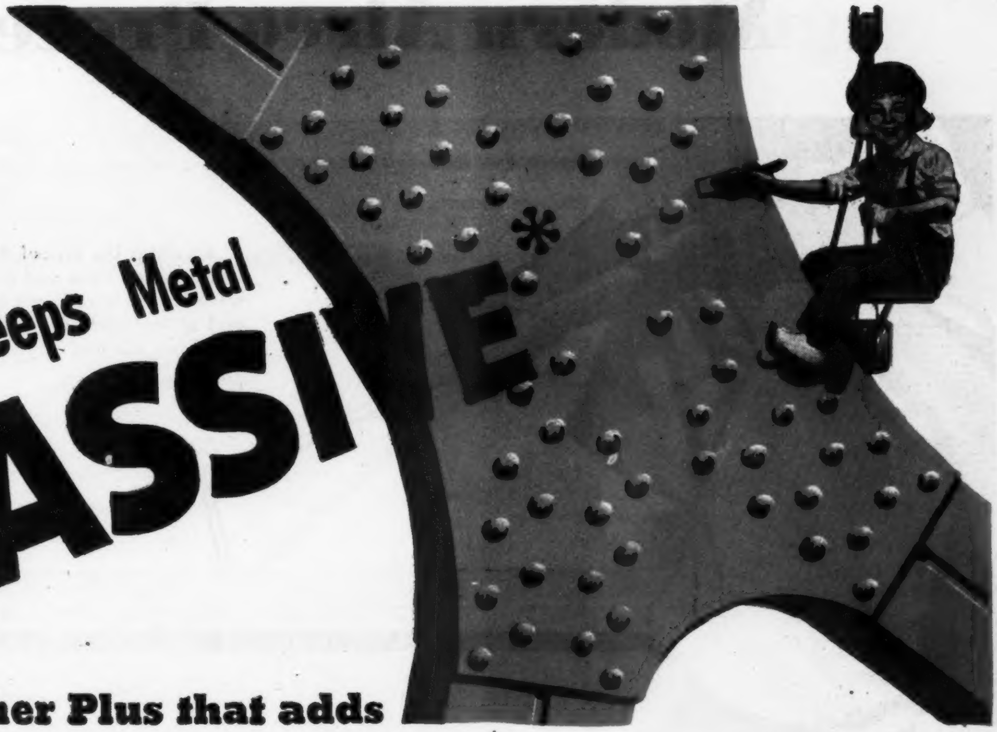
Replacement of obsolete material is an easy task with Oliver "Cletracs." Simply yank off the outmoded compressor, welder, etc., and install a new one. The rugged construction of these husky tractors assures years of dependable, economical service. Exceptional accessibility makes maintenance simple. And the patented *controlled differential steering* found only on Oliver "Cletracs" keeps power on both tracks at all times . . . assures greater safety on turns and slopes, plus ease of control.

Investigate Oliver "Cletracs" for your jobs. Substantial numbers are now being released for essential use. Your Oliver "Cletrac" dealer will gladly assist you in making application for a new tractor. **The OLIVER Corporation,** Industrial Division, 19300 Euclid Avenue, Cleveland, Ohio.

OLIVER - Cletrac



THE OLIVER CORPORATION



Keeps Metal PASSIVE*

...another Plus that adds to RED LEAD'S Extra Rust Protection...

There is no question about Red Lead's acceptance throughout industry as the standard priming paint for *making metal LAST*.

One important reason is its ability to keep metal surfaces in a "passive" or rust-inhibiting state. Authorities agree that metal protective paint should be rust-inhibitive to give satisfactory performance.

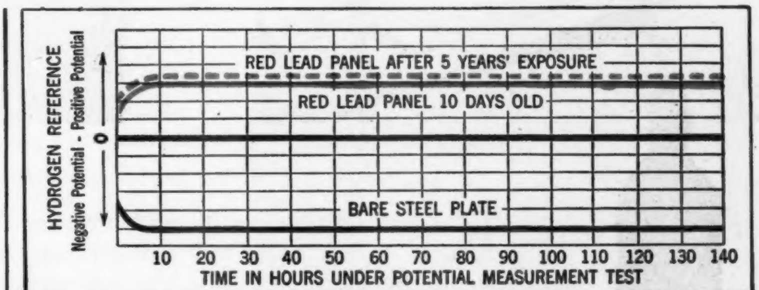
Time-potential curves, such as the one at right, are used to express rust-inhibitive properties of paint and thus indicate its effectiveness of protection. They show the effect of Red Lead on the potential of steel in the presence of moisture or water.

For example, a steel panel whose potential is *positive*, relative to hydrogen, is considered to be in a passive or non-corroding state. A negative potential indicates corrosion activity or rusting. The graph shows clearly the rust-inhibitive effect of Red Lead paint on steel as contrasted with the rapid and continuous rusting of unpainted steel.

Note that in this test a Red Lead paint film which had weathered 5 years was just as effective in preventing rust as one which had dried for only 10 days.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better metal paint if it contains Red Lead.



*Proof That Red Lead Keeps Metal Passive

In the above test a piece of unpainted steel was immersed in water. Iron, going into solution, reacted with oxygen in the water to form rust. This unrestrained corroding state is indicated by a rapidly developed and maintained negative potential (see above graph). However, when steel panels painted with Red Lead were immersed under the same conditions, ferric and lead salts formed directly next to the metal. This action at once stifled corrosion by preventing the iron from going into solution, thus keeping the steel surface passive. The result is shown in the graph curves above, where a quickly rising positive potential remains constant throughout the test.

Write for New Booklet—*"Red Lead in Corrosion Resistant Paints"* is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas ... ranging from Red Lead–Linseed Oil paints to Red Lead–Mixed Pigment–Varnish types. If you haven't received your copy, address nearest branch listed at right.

All types of metal-protective paints are constantly being tested under all conditions at National Lead's many proving grounds. The benefit of our extensive experience with Red Lead paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston 25, W. Va. (Evans Lead Division).

DUTCH BOY RED LEAD

Modern Airco Processes

Building Up Wheel Burns. Using the oxyacetylene torch and the Airco RR Rod, wheel burns in rails are built up quickly and at low cost. The operation requires but a few minutes.

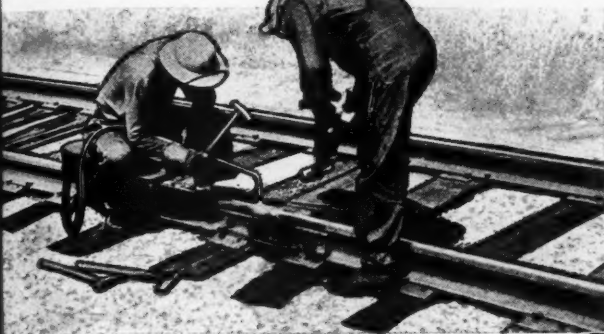
KEEPING America's rail lines functioning smoothly under the multiplied strain of wartime traffic with depleted manpower called for the greatest ingenuity on the part of those charged with maintenance of way.

In the accomplishment of this miracle of transportation, modern Airco oxyacetylene and electric arc processes have played an important part, as they have in supplying the tools of victory to our armed forces. They save time, manpower, and dollars in maintenance of trackage, right-of-way structures, track tools and equipment.

Airco's Applied Engineering Department offers you the benefits of its years of service to America's carriers in the application of these processes to your problems. For complete details, ask any Airco office or write Dept. REM at New York.

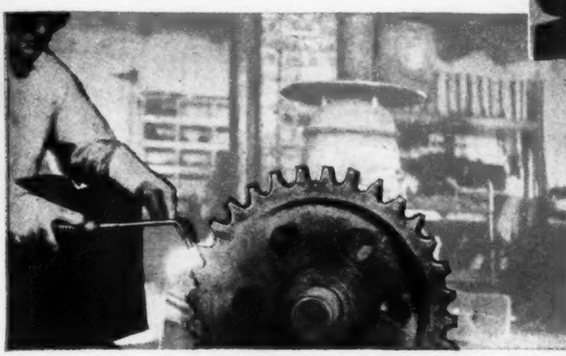
AIRCO

Help Keep 'Em Highballing

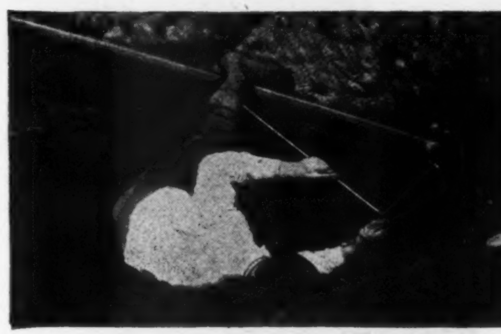


Reforming Rail Ends. Worn and battered rail ends are speedily restored by the oxyacetylene process. The cost of this operation is low.

Gas Welding in Construction. Oxyacetylene welding speeds construction of many types of right-of-way structures such as this signal pole.



Equipment Maintenance. The electric arc and oxyacetylene torch play important roles in the maintenance of track tools and equipment. Here worn teeth on the drive gear of a clam shell are being built up by depositing new metal.



Pipe Welding. Oxyacetylene flame and electric arc welding are widely used to produce strong, leakproof joints in steam, water, compressed air and other piping systems. Joints are made quickly and at low cost.

OTHER AIRCO PROCESSES KEEP 'EM ROLLING

Butt Welding with the oxyacetylene torch eliminates troublesome maintenance on rail joints.

Rivet Washing with the oxyacetylene torch speeds rivet removal without injuring the plate.

Crowning Angle Bars, with the oxyacetylene torch takes out the dip and facilitates the restoration of uniform rail end surfaces.

Flame Cleaning with the oxyacetylene flame quickly and thoroughly removes old paint, rust and scale from steel structures before repainting.

AIR REDUCTION

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities

Represented Internationally by Airco Export Corporation

Verona *Fixed Tension* Triflex Springs

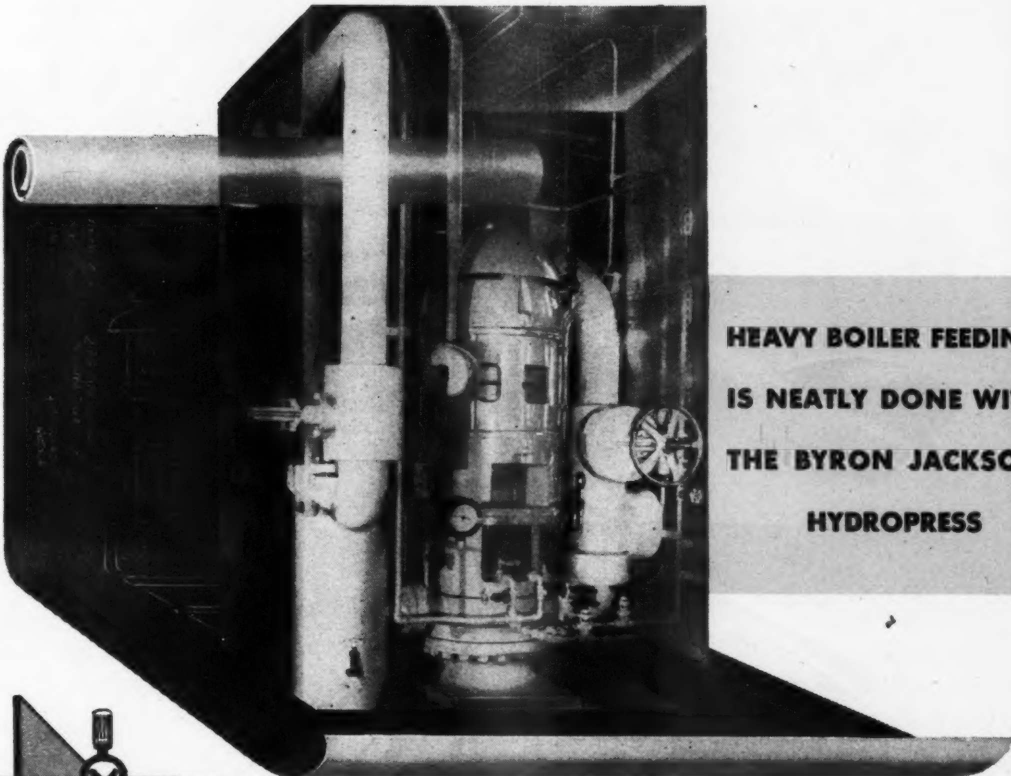
DESIGNED and manufactured to assure highest reaction and adequate, uniform bolt tension at all times

SINCE 1873

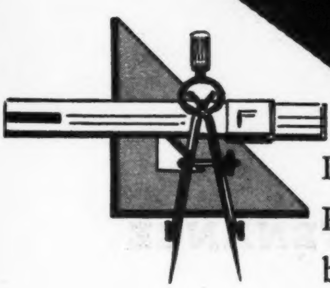
WOODINGS-VERONA
TOOL WORKS, VERONA, PA.

SINCE 1873

IN 2 BY 5 BY 8



HEAVY BOILER FEEDING IS NEATLY DONE WITH THE BYRON JACKSON HYDROPRESS



Installed in 1940—this 15″ 16-stage Hydropress Boiler Feed Pump, with its 150 hp, 2300 volt, 3600 rpm motor, requires but ten square feet of floor space, yet provides 100,000# per hour at 850 psi.

Particularly advantageous where the npsh is limited, the Hydropress is but one of three types of pumps especially developed by Byron Jackson for Boiler Feed Service.

Capacity and pressure conditions can be met and limitations of available floor space and npsh can be overcome. Let's discuss your particular problem.

CENTRIFUGAL AND TURBINE PUMPS
SUBMERSIBLE MOTORS

ARMY (E) NAVY

BYRON JACKSON CO.
Houston • LOS ANGELES • New York

A New Line of Forged Adjustable Rail Braces

PRESENTED BY

PETTIBONE MULLIKEN CORPORATION

. . *THE RESULT OF SUGGESTIONS FROM RAILROAD MAINTENANCE OF WAY AND SIGNAL DEPARTMENTS*

Maximum Bracing—Minimum Maintenance—Longer Service Life

PETTIBONE MULLIKEN design (1) Reduces the need for full rigid clamping. (2) Supplies constant bracing to the rail whether bolts are tight or loose or whether no bolts are used. (3) Controlled flexibility—not attempting to stop the wave or up-and-down motion of the rail, yet restricting tipping or side-thrust—no wide gage—close signal adjustments. (4) Provides larger, better fitting wearing areas of forged, corrosion resistant steel, thus reducing the frequency of adjustment. (5) Makes infrequent adjustment easy.

Two Bolt Brace

Bolts will be initially tighter and will stay tight longer than on other bolted braces. Maintains gage and is an effective brace to the rail even if bolts work loose. Square-head acorn nuts spaced for 180° turn with ordinary track wrench. 11 pieces—easy to install, adjust or remove.

One Bolt Brace

Bolt will be initially tighter than on other braces. Single bolt acts as a pivot under rocking motion caused by change of wheel weight from receiving to leaving edges of plate—tends to remain tight longer. Maintains gage and is an effective brace to rail even if bolt works loose. Square-head acorn nut permits 180° turn with ordinary track wrench. 8 pieces—easy to install, adjust or remove.

Boltless Brace

No bolts to corrode, wear or tighten. Controlled flexibility—up and down or wave motion of rail is not limited, yet restricts its tipping or side-thrust. Maintains gage, and permits accurate signal adjustments. Simplicity assures proper maintenance. Design permits single or double spiking on outside of stock rail if desired. 4 pieces—wedge, brace, key and plate.

Write for Bulletin No. 1101

"Quality Since 1880"

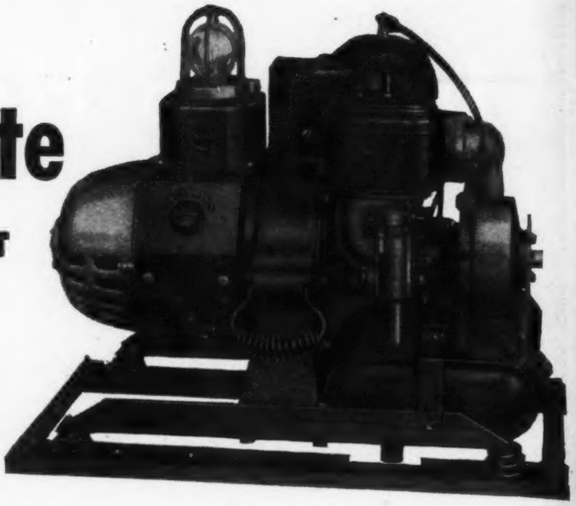
PETTIBONE MULLIKEN CORPORATION

4710 West Division Street, Chicago 51, Illinois


Use the CARGOCRANE in the SHOP - as well as in the YARD!
Here's a production tool, useful in many types of assembly and repair shop work, in addition to the usual loading, stacking and material handling operations. Speed in hoisting and travelling, easy handling in close quarters, and plenty of power are features of the CARGOCRANE that make it the preference of shopmen and storekeepers.
10,038
LINK-BELT SPEEDER
GET A POWERFUL LIFT WITH A
LINK-BELT SPEEDER
Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES
LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

Pick Up a Homelite

AND GIVE YOUR MEN A LIFT



Speed up your bridge and trestle construction, with electric saws and drills. Easily portable . . . a Homelite Gasoline-Engine-Driven Generator will supply dependable current . . . 2000 watts . . . wherever and whenever you need it.

Homelite units cost less to use and maintain because they have a cool running engine that is automatically lubricated by oil which is always new. Morever, Homelites use oversize ball bearings throughout and are equipped with a simplified magneto and automatic built-in governor.

Homelite Corporation

Portable PUMPS • GENERATORS • BLOWERS
PORT CHESTER, NEW YORK

NEW MUSCLES

FOR OLD BRIDGES

Here is a typical Morrison refabricating job performed for a leading trunk line railroad on 54 spans. By utilizing oversize, old girders that can be shortened, reduced in depth or altered to fit new locations, it is possible to have redesigned structures with a minimum of new steel, without delay and at a cost of less than half that of new.

We are specialists in the redesign of bridge structures for remodeling, reenforcing, and maintenance repairs by welding to standing structures, or structurally sound bridges, which through abandonment, are available for use elsewhere, requiring only refabrication to meet load capacity and new location.

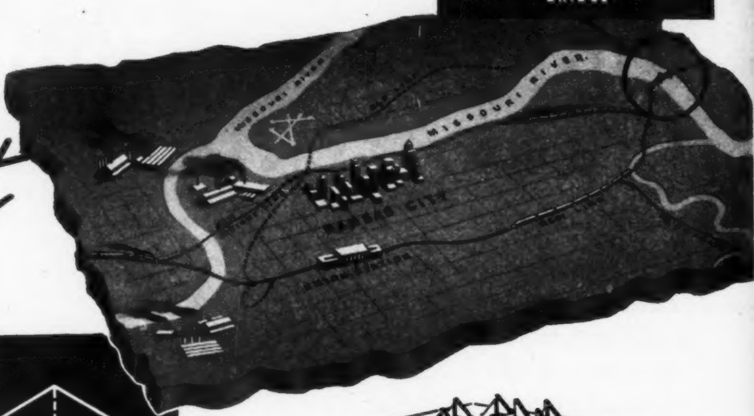
Our facilities include experienced and qualified supervisors, engineering personnel and portable equipment for performing the work in the field as well as a modern steel fabricating plant for preparing the required material in accordance with detailed plans and shop drawings prepared by us.

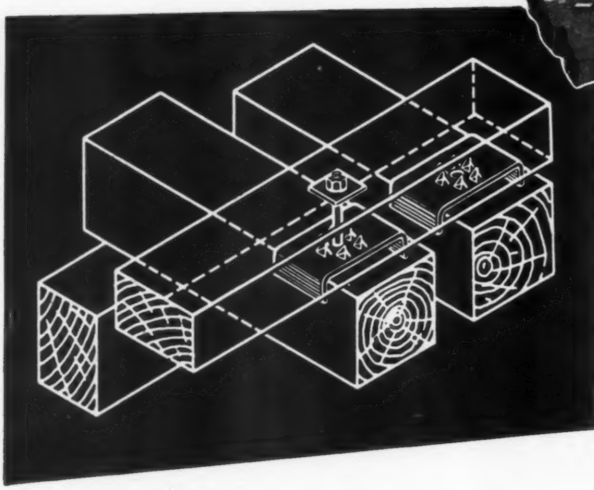
If you have a problem of remodeling, repair or strengthening your steel bridges, we will welcome the opportunity without obligation on your part to make survey, prepare plans of our recommendations and quote price for the entire job including the fabricated steel and work on the site.

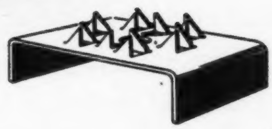
MORRISON METALWELD PROCESS, INC.
A SUBSIDIARY OF
MORRISON RAILWAY SUPPLY CORP.
EXECUTIVE OFFICES · · · BUFFALO 12, N. Y.
CHICAGO 4, ILL. BIRMINGHAM 3, ALA.

TIES *Tied Tight*

PRES. HARRY S. TRUMAN BRIDGE







TECO CLAMPING PLATES *Provide Positive* "FIX" BETWEEN GUARD RAIL AND TIES ON NEW ROCK ISLAND SPAN

THE NEW PRESIDENT HARRY S. TRUMAN BRIDGE, which spans the Missouri near Kansas City, means better, faster, and more efficient service for the patrons of the Rock Island and Milwaukee Roads.

The *building* of the bridge is an expression of a fixed policy of constant improvement adopted long ago by the engineering departments of the two roads. Its *design* is also an expression of this policy.

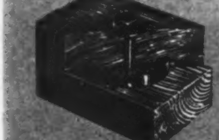
The ties on this new structure will remain evenly spaced under rails and guard rail because each is positively fixed at each end by a TECO FLANGED CLAMPING PLATE. The plate was developed by the Timber Engineering Company as a result of suggestions by Rock Island engineers.

Clamping plate timber connectors provide the most modern means of attaching ties to guard rail rigidly . . . with low maintenance cost. Bolts are used in every third or fourth tie which lowers replacement costs. Fewer bolt holes mean fewer traps for moisture in the timbers . . . and longer life.

Design your next bridge for TECO TIE SPACERS. Get design data by using the coupon below . . . NOW.

Timber Engineering Co., Inc. of Washington, D.C.

Washington • Chicago • New Orleans • San Francisco



SPECIFY TECO CONNECTORS
SPLIT RINGS • SHEAR PLATES
GROOVING TOOLS

USE THIS COUPON

Timber Engineering Company
1319 Eighteenth Street, N. W., Washington 6, D. C.

Please send me complete design data for TECO CLAMPING PLATES.

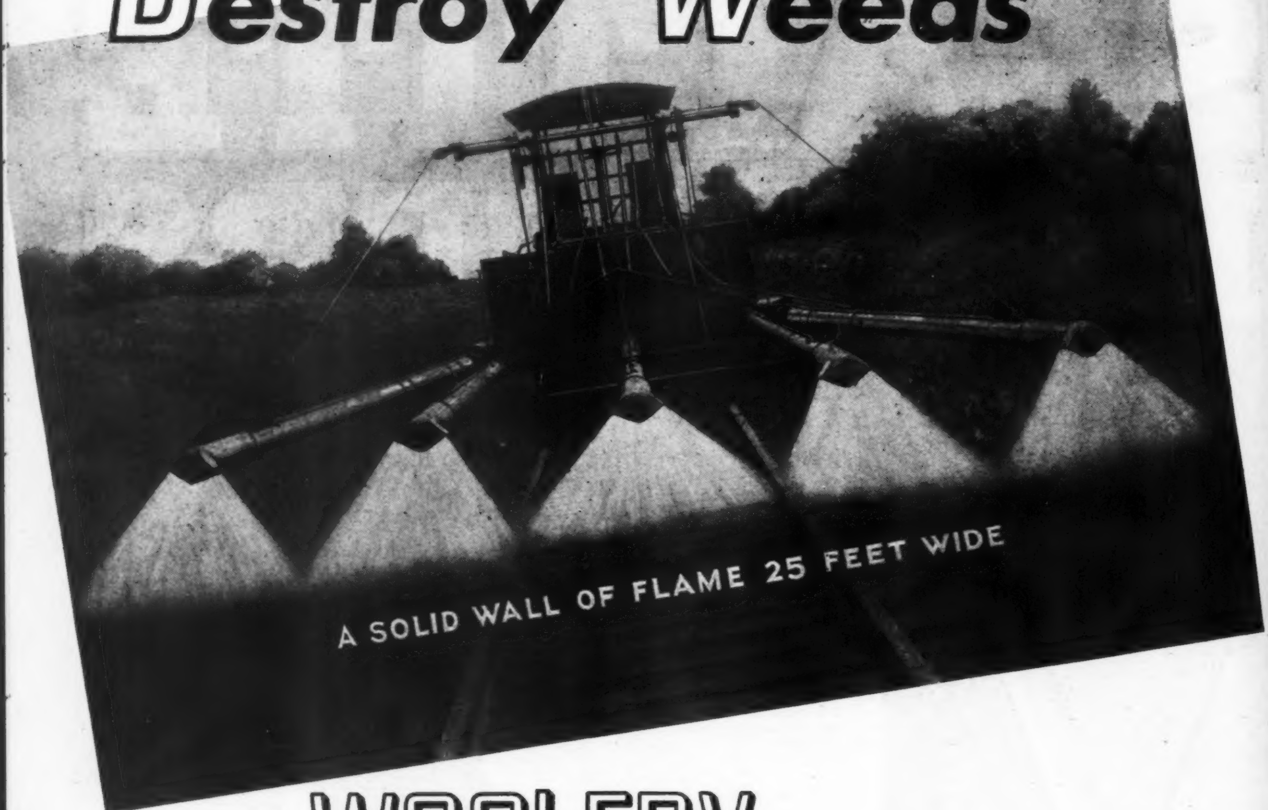
Name...

RR.............................. Title..................

Address...

City.............................. State.................

Destroy Weeds



with WOOLERY weed burners

Effective, economic weed destruction is an important factor in maintaining good roadbed, and good roadbed is necessary to operate high-speed, heavy-load trains.

The hot, high velocity flames of Woolery Weed Burners sear green as well as drying vegetation thereby efficiently destroying it. Such effective eradication of roadbed weeds results in better drainage, increases tie life, reduces fouling of ballast, and minimizes slipping of locomotive drive wheels.

Woolery Weed Burners are available in four different models—5-burner, 3-burner, 2-burner, and 1-burner. There is a best size for each condition.

Over 75 Railroads Use

WOOLERY MAINTENANCE EQUIPMENT

TIE CUTTERS — WEED BURNERS — CREOSOTE SPRAYERS

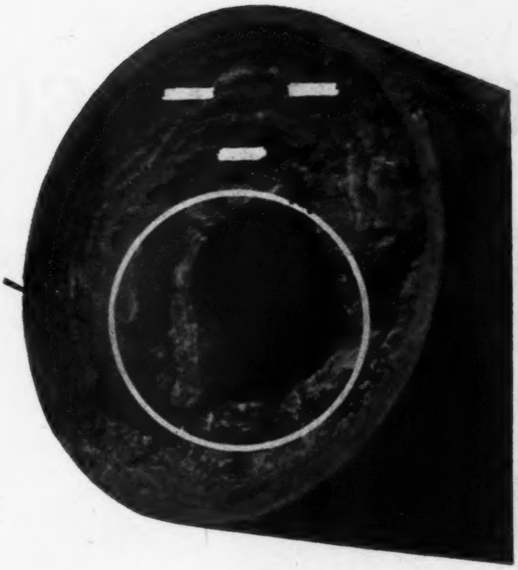
WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS · MOTOR CARS · TIE CUTTERS · TIE SCORING MACHINES · RAIL JOINT OILERS · CREOSOTE SPRAYERS · BOLT TIGHTENERS

EXCLUSIVE EXPORT REPRESENTATIVES PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.



GRIND IT ACCURATELY...

In railway construction and maintenance, Thor Rotary Air Grinders make tough jobs easier. Out on the section, or in the shops, Thor Grinders assure top-speed precision production. There's a size, model and speed for every job. Fast, easy handling cuts manhours to a minimum. Thor's advanced construction features—*work-tested for 50 years*—guarantee peak efficiency, maximum power and extra stamina. Leading railroads specify Thor Tools. Write for Catalog 52-B.

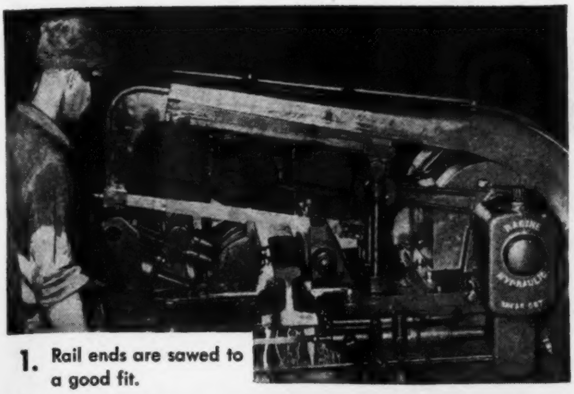
INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. Jackson Boulevard, Chicago 6, Illinois

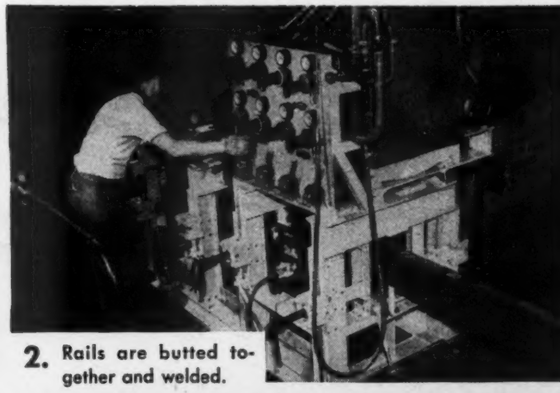
New York — Los Angeles

Thor PORTABLE POWER TOOLS

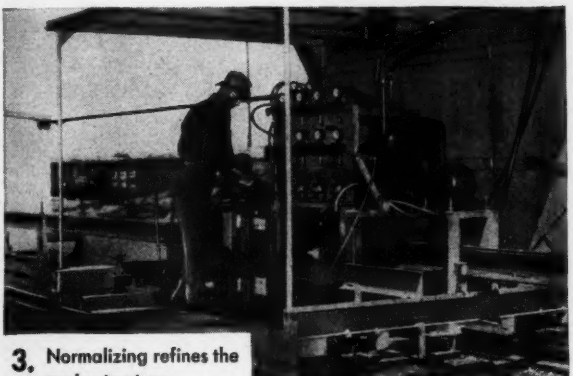
PNEUMATIC
UNIVERSAL ELECTRIC
HIGH FREQUENCY ELECTRIC



1. Rail ends are sawed to a good fit.



2. Rails are butted together and welded.



3. Normalizing refines the grain structure.

4. The joints are ground to a smooth surface.

CENTRALIZE YOUR PRESSURE-WELDING for savings in time and materials...

● A central setup for pressure-welding makes it possible to produce at low cost long or continuous rails from odd and short lengths or from standard rail lengths. Uses of pressure-welded rails include: two or three rail lengths long for road and street crossings; moderate lengths for station platforms or bridges; double-lengthed, cropped second-hand rail for secondary tracks; and long continuous lengths for tunnels or open track. Oxweld representatives can tell you more about the economies of pressure-welded rails to reduce rail maintenance costs.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building   Chicago and New York
BUY UNITED STATES WAR BONDS AND STAMPS

OXWELD RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

Compression Rail Anchors

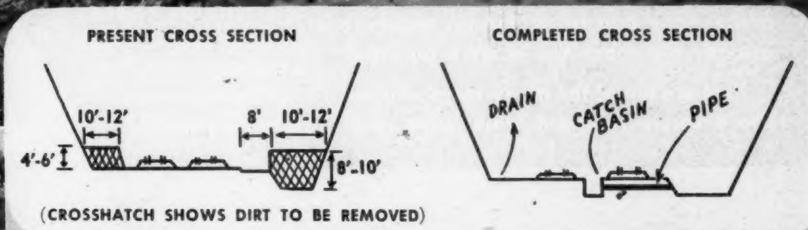
Compression Rail Anchors provide economical and effective two-way holding of the rail. Can be applied to any rail section old or new.

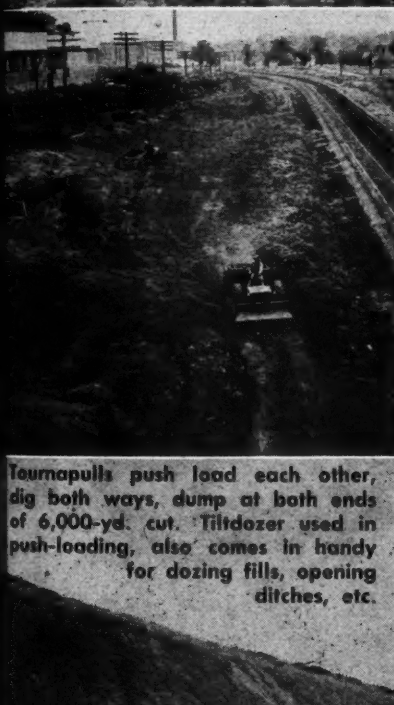
THE RAILS COMPANY

General Office
178 GOFFE STREET, NEW HAVEN 11, CONN.

ST. LOUIS, MO. HOBOKEN, N. J. CHICAGO, ILL.

SOUTHERN solves drainage problems with small off-track *TOURNAPULLS*





Tournapulls push load each other, dig both ways, dump at both ends of 6,000-yd. cut. Tiltdozer used in push-loading, also comes in handy for dozing fills, opening ditches, etc.

A fleet of small, fast-traveling Tournapulls are being used by the Southern Railroad to solve drainage problems. This 2100-foot cut on the main line between Washington, D.C. and Greenville, S.C., is typical. Water stood in this cut after heavy rains; Tournapulls clean out eroded material, smooth and slope right-of-way, dig drainage ditches.

Tournapulls are one-man operated, each independent of delays to other units. They handle the complete excavation operation including load, haul and spread; they work and move job-to-job under their own power, on the highway or down the right-of-way without blocking tracks or delaying traffic. Two to three times faster than crawling tractors, they are especially suited to this type of work where long hauls are involved.

Save Time, Money, Manpower on small maintenance jobs

These small Tournapulls can save you a lot of time and money on scattered small yardage dirtmoving jobs in the maintenance department. They work alone or in pairs with no need for extra laborers or man-power . . . can be used to quickly take care of needed drainage, erosion control, and other odd-job dirtmoving which is now a headache for your short-handed section crews.

Southern's small, light Tournapulls were developed for the Aviation Engineers to handle utility jobs fast in widely scattered areas. Due to cutbacks in military requirements, a few are available for civilian use. For lowest net cost per yard on major, continuous-production grading, investigate the larger Tournapulls, job-proved units that have revolutionized the dirtmoving industry. For more information, write to Industrial Division, R. G. LeTourneau, Inc., Peoria, Ill. Do it NOW.

RRB

Manufacturers of Tournapulls*, Angledozers*, Buildozers, Tiltdozers*, Carryall* Scrapers, Power Control Units, Rooters*, Tournatrailers, Tournacranes*, Tournatrucks*, Sheep's Foot Rollers, Tournarope*, Tournaweld*, Tournalifts*.

*Trade Mark Reg. U. S. Pat. Off.

LETOURNEAU

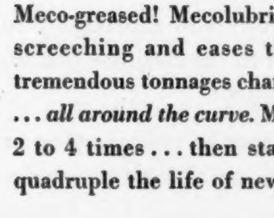
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Mecolubrication RELIEVES *Flange Friction Load*

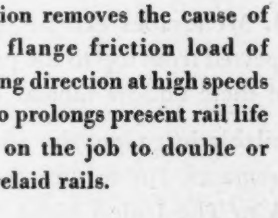
There's no "squeal" on the curves that are Meco-greased! Mecolubrication removes the cause of screeching and eases the flange friction load of tremendous tonnages changing direction at high speeds ... *all around the curve.* Meco prolongs present rail life 2 to 4 times ... then stays on the job to double or quadruple the life of new, relaid rails.

Maintenance Equipment Company

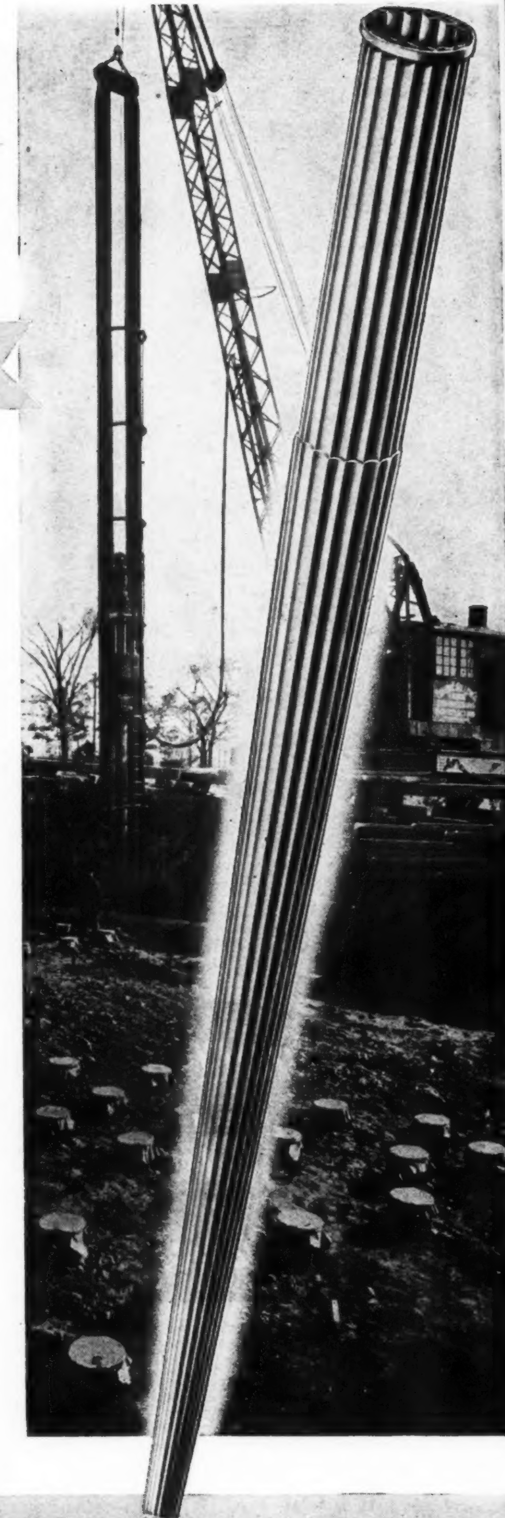
RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS



Power Rail Layer Requires No Train Orders



Mack Reversible Switch Point Protectors Make switch rails last 8 to 10 times longer



NO. 200 of a Series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO 3, ILL.

Subject: Where Can We Serve Best?

Dear Readers:

August 1, 1945

Knowing as we do of your many problems, especially your present urgent need for man-power, it was not surprising to me a few days ago to hear a member of our editorial staff make the suggestion that, if we really want to help the railroads, we could do so best by going back to our old railroad jobs until the labor pinch is over. Quite obviously, this suggestion contained a facetious note, but there was just enough seriousness in it, born of a desire to be of maximum help to the railroads, to warrant a bit of comment.

In some respects this suggestion was not too humorous, and from the standpoint of giving some road or roads a few more man-hours of conscientious labor, it is not entirely impracticable either. In fact, with combined practical experience on our staff which covers every phase of maintenance of way and structures work, we would be willing to argue with anyone who might suggest that we couldn't be of some real help back on our old jobs. But would that be in your best interest?

I am prompted to question this seriously for many reasons, not the least of which are suggested by a number of letters received recently, including one from Col. J. Monroe Johnson, Director of the Office of Defense Transportation, and one from a chief engineering and maintenance officer. Mr. Johnson wrote in part:

"Your publication has well performed an important part in the war effort by informing those who supply and use transportation of its accomplishments and the difficulties which must be surmounted in meeting the national needs."

The chief engineering and maintenance officer wrote in part:

"The articles in this (July) issue are so outstanding that it is difficult to pick out any of them that are of more current interest than the others."

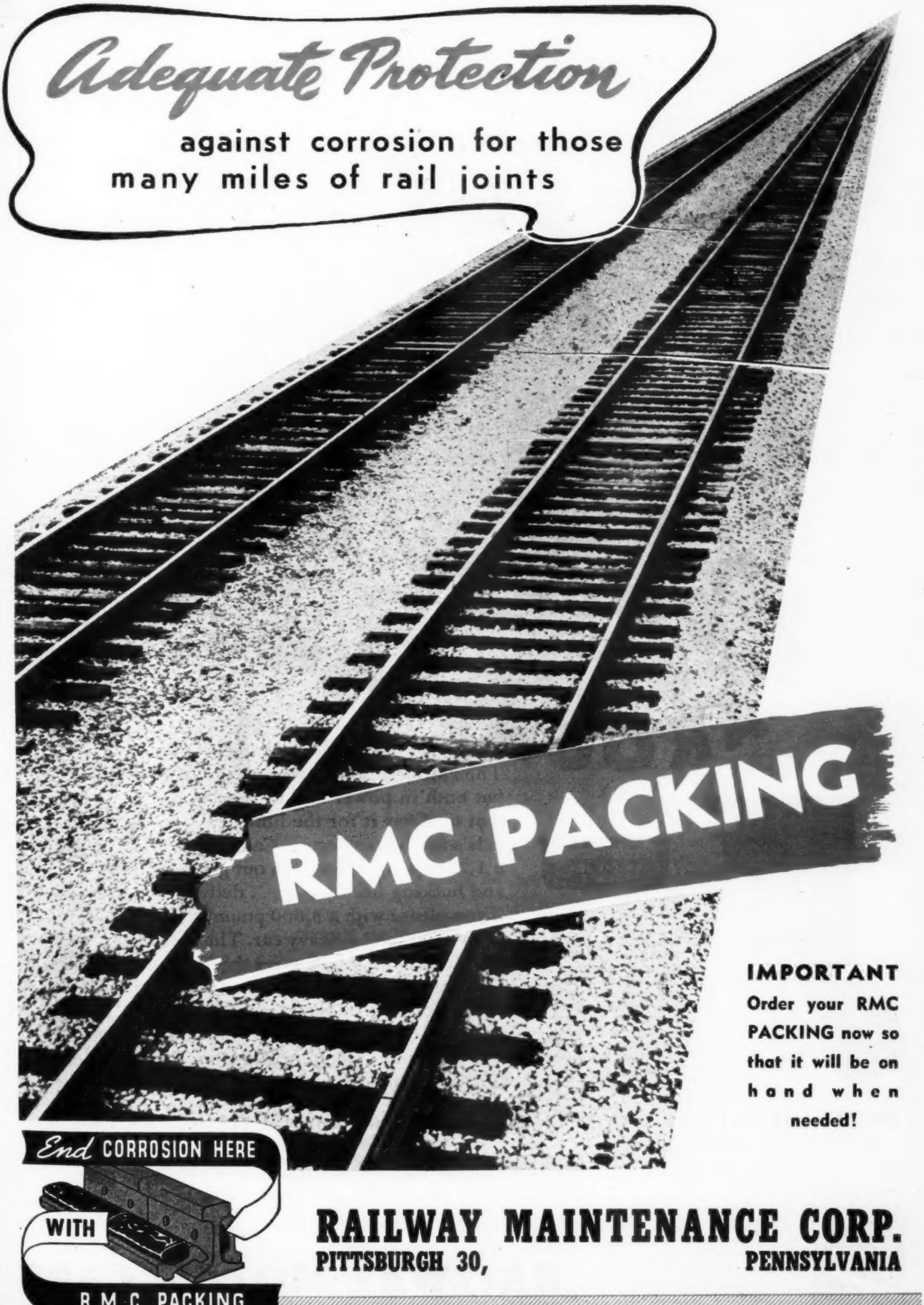
If we are permitted to accept Col. Johnson's commendation at face value, and can construe the railroad officer's word "interest" to mean "helpful", I am convinced that we can do our best job in the interest of the war effort, the railways, and you individually, by continuing to collect and make available through our pages each month information that will be of maximum help to you in carrying out your highly essential work.

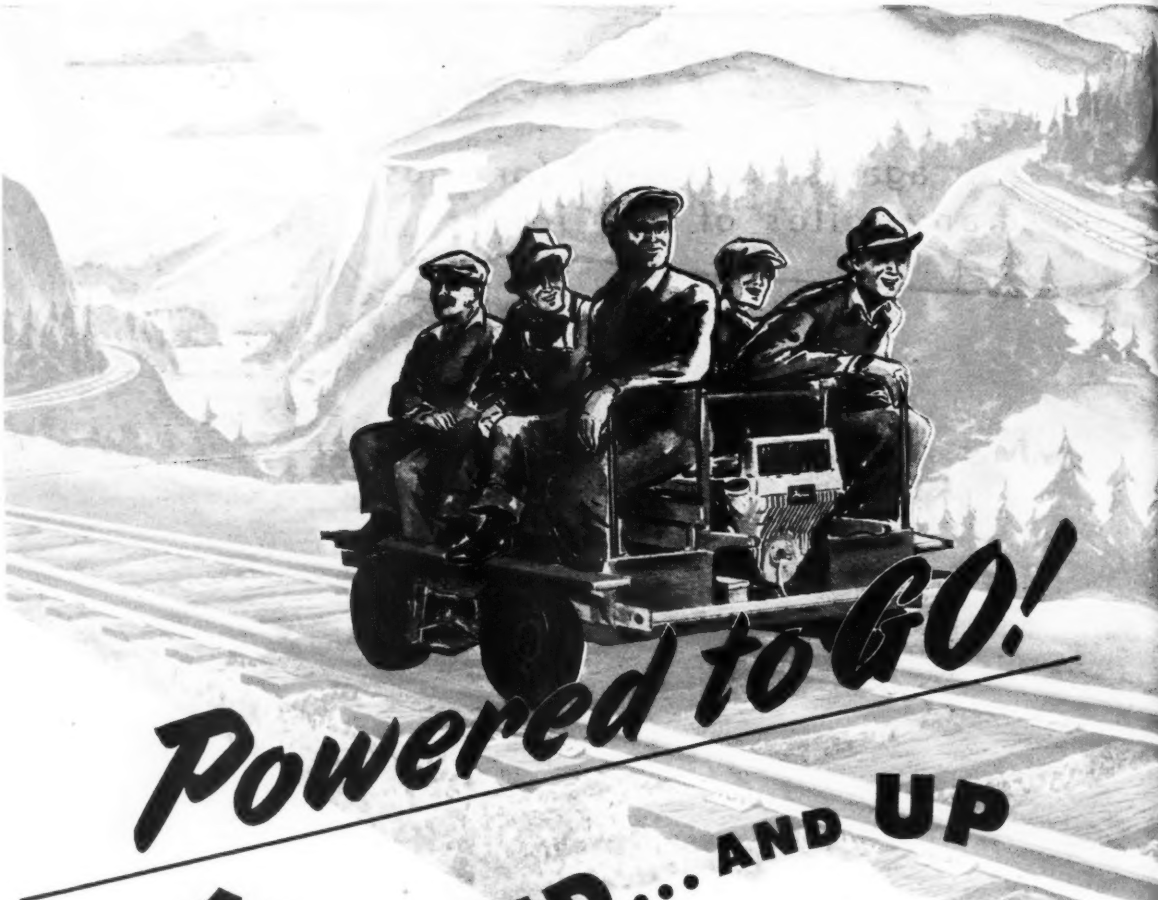
Sincerely,

Neal D. Howard

Editor.

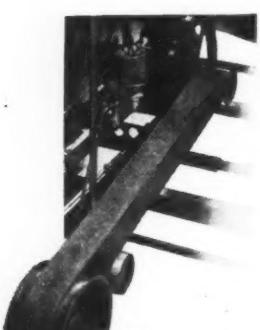
NDH:JB


Adequate Protection
against corrosion for those many miles of rail joints
RMC PACKING
IMPORTANT
Order your RMC PACKING now so that it will be on hand when needed!
End CORROSION HERE
WITH
R M C PACKING
RAILWAY MAINTENANCE CORP.
PITTSBURGH 30, PENNSYLVANIA



Powered to GO!

AROUND ... AND UP



Performance
ON THE JOB COUNTS

Note the strength and simplicity of this transmission... The Fairmont endless cord belt drive with Timken tension control has proved, under all conditions, to be the most efficient type of drive known for inspection and section cars.

The Fairmont M14 Series G is a Light Section Car, but both in power and construction it has a "plus" that qualifies it for the limit loads in that division. It is a full 6-man Section Car that breezes along with a 1,200 lb. load, leveling out grades, taking curves, and bucking headwinds . . . delivering performance if you please with a 3,000 pound trailer load in tow. Even so, it isn't a heavy car. The rear lifting weight is only 112 lbs. which gives this car the added utility of filling in on the 1 and 2-man jobs. Yes, this is one of the four Fairmont cars powered by Fairmont's RO Hy-Load Roller Bearing Engine. Bulletin 397 will tell you all about it. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

OF ALL THE CARS IN SERVICE TODAY . . . MORE THAN HALF ARE FAIRMONTS

"Civilization Follows Transportation," authentically illustrated in color by Walter Haskell Hinton, will be mailed free. Send us your name and railroad address.

Fairmont
RAILWAY MOTOR CARS

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

August, 1945

Published on the first day of each month by the

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 West Adams St., Chicago 3

NEW YORK 7, 30 Church Street

CLEVELAND 13, Terminal Tower

WASHINGTON, D.C., 4, 1081 National Press Bldg.

SEATTLE 1, 1033 Henry Bldg.

SAN FRANCISCO 4, 300 Montgomery St.

LOS ANGELES 14, 530 West 6th St.

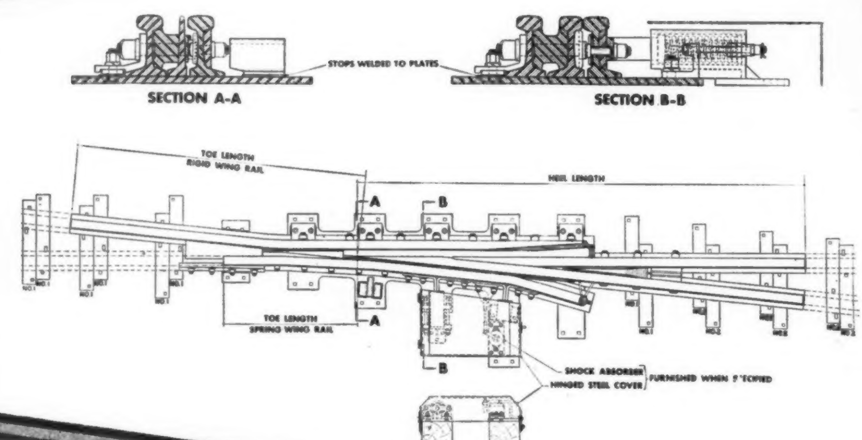
DALLAS 4 4518 Roland Ave.

Subscription price in the United States and Possessions and Canada, 1 year $2, 2 years $3; foreign countries, 1 year $3, 2 years $5. Single copies, 35 cents each. Address H. E. McCandless, Circulation Manager, 30 Church Street, New York 7, N.Y.

Member of the Associated Business Papers (A.B.P.) and of the Audit Bureau of Circulations (A.B.C.)

PRINTED IN U.S.A.

THE RACOR SPRING FROG



made rugged to take its own punishment

There's no substitute for rugged construction in a spring frog, where its parts get plenty of punishment from its own operation.

There's no substitute for Racor experience and thoroughness in building such a frog so that it combines simplicity, correct design and the necessary ruggedness to assure long service life.

Yet, in order to give greater protection to every wheel flange after the frog has been entered, the Racor Spring Frog may, when so specified, be furnished with a shock absorber. This absorber limits the speed of closing of the spring wing rail while assuring safe, tight contact at moment of return to normal closed position.

The Racor Spring Frog shown above is one of a complete line of Racor standard turnout frogs which include all the most widely known movable wing and rigid types. Back of the efficiency and long life of each frog is the leadership for which Ramapo Ajax has been known in the manufacture of trackwork and trackwork products.

Brake Shoe

RAMAPO AJAX DIVISION

332 South Michigan Ave. • Chicago 4, Illinois

HILLBURN, N. Y. • SUPERIOR, WISCONSIN • NIAGARA FALLS, N. Y. • LOS ANGELES, CALIFORNIA
NEW YORK, N. Y. • SEATTLE, WASHINGTON, • EAST ST. LOUIS, ILL. • NIAGARA FALLS, ONTARIO • PUEBLO, COLO.

4168

Railway Engineering and Maintenance

Passenger Traffic—

The Critical Problem in the Months Ahead

The war is really on for the railroads. If there are railway officers or employees who have questioned the vital importance of their part in the war effort, the events of the last month, highlighted by the rapid succession of orders issued by the Office of Defense Transportation virtually commandeering railway passenger train equipment for use by the armed forces, should convince them beyond doubt that they are playing a part second to none.

It is well that those working on the railroads sense their great responsibility to the war effort and recognize the magnitude of the job that still must be done. At the moment, with little let-up in the total freight load being carried by the railways as a whole, and in spite of a still increasing burden of freight traffic on the roads of the West, the crucial test for the railways lies in meeting the passenger transportation demands of the country, which have been magnified many fold by the withdrawal of 3,100,000 troops from Europe at a rate far exceeding original plans.

Under the original plans, it was contemplated that approximately 280,000 troops would be returned in each of the first four months following V-E Day, but late in July it was expected that the number in that month would exceed 400,000, with an equal number to arrive in August, and the prospect of an ultimate peak of 500,000 a month. According to Col. I. Sewell Morris, chairman, Railroad Urgency Committee, this will mean that, even with the maximum co-operation of the public in limiting civilian travel, "the railroads will be taxed to capacity for months to come, and that by December of this year about 1,500,000 members of the armed forces will be criss-crossing the nation in large special movements, with other movements of smaller groups that will increase the number to approximately 2,000,000."

According to Fred M. Vinson in his recent quarterly report to Congress as director of war mobilization and reconversion, the present and prospective movement of the armed forces in redeployment, plus the relocation of labor incident to partial reconversion of industry to civilian production, and essential civilian travel, will "push passenger traffic in 1945 up to 107,000,000,000 passenger-miles—10 per cent above the all-time record created in 1944."

In the face of such inordinate demands, it is not surprising that there is a serious pinch in railroad passenger service. Not surprising either are the recent orders of the O.D.T. placing a five-day limit on advance Pullman reservations; prohibiting the operation of sleeping cars on runs of 450 miles or less; and placing all railway passenger train cars, except sleeping cars, in a pool available for use by the army and navy, as required. And still more drastic measures curtailing all but the most essential civilian travel may well be expected, if necessary, because the armed forces must have right of way, and our victorious fighting men who were sent away in Pullmans must not be confronted on their homecoming with the prospect of long overnight journeys in crowded coaches.

As for the part of maintenance men in the test that lies ahead, it is their responsibility, jointly with those in the operating and mechanical departments, to see that every passenger train goes through expeditiously and safely. Handicapped as they are by shortages in labor and materials, this will not be an easy job. But lest one be tempted to complain or falter, let it be remembered that neither is the job easy that is cut out for most of the GIs that are now crowding the rails.

Cropping Rail—

What Length of Ends Should Be Removed?

FOR many years it has been the practice on a number of roads to crop and re-drill rail released from main-line tracks, usually at some central point, but in at least a few cases, in track. The purpose of cropping in all cases is essentially the same—to remove that portion of the rail ends that have been damaged by batter, wear in the fishing surfaces, and corrosion, and thereby secure good joint conditions when this rail is relaid in secondary main lines or important branch lines. Where this practice is followed, one rule is axiomatic, and that is that if the rail is to be cropped at all, it should be cropped sufficiently to insure as near perfect joint-bar fit as possible. To do this, it is obviously necessary that all the unsuitable portion of the rail ends be removed. For example, on rail that has been joined with 24-in. joint bars, it will usually be found advisable to cut off at least 12½ in. from each end, and, in many cases, as much as 15 to 18 in. These longer cuts may seem excessive, because they shorten the length of the rail by 2½ to 3 ft., but they may be advisable for several reasons.

In the first place, not all batter occurs at the extreme ends of the rail. What is commonly called secondary batter, caused by a combination of conditions, usually occurs from 6 to 12 in. from the ends of the rail, the distance varying primarily with the speed of trains. To secure good joints in second-hand rail, therefore, the cropping done should remove all secondary batter.

Secondly, the cropping should remove all of that part of the rail that has been worn in the fishing areas by joint action. While most of the wear between the rails and joint bars takes place a short distance back from the immediate rail ends, the entire areas contacted by the joint bars are subject to some wear, a fact that is clearly evident when joint bars are removed from old rails. Unless all of the rail ends within the limits of the old joints are removed, including the small additional amount that may have been subject to wear through expansion and contraction, joint bars will not support the new rail ends properly when the rail is relaid, and poor joint conditions will soon develop.

In addition, the cropping should remove all of the badly-corroded portion of the rail ends. This condition is likely to be found to be particularly severe in the case of rail removed from highway crossings, tunnels and tracks which handled a large volume of refrigerator traffic; likewise in high-speed territory where stack or front-end ashes are whipped behind joint bars. In such locations and such tracks, unless protected by joint packing, the corrosion is usually more severe directly within the joint area, including a section of the rail a few inches away from the ends of the joint bars. Such rail should be cropped far enough back from the ends of the old joint bars to include all of the excessively corroded portion of the rail.

While these factors apply primarily to rail that has been joined with 24-in. joint bars, the same considerations apply to rail that has been fitted with 36-in. bars. In the latter case, however, secondary batter is usually not quite so severe and is usually located well within the limits of the bars. Unless brine corrosion is a factor, 18½ in. is usually a satisfactory cropping limit in this case.

The importance of cropping rail far enough from the ends to insure good joints when relaid in track may not be readily apparent, but the reduced joint maintenance that will be realized shortly after the cropped rail is laid, and for a long time thereafter, will offset by many times the cost of maintaining the added number of joints per mile, and any lost value in the additional metal cropped.

Tie Shortage—

Will not Be Eased by Relaxing Standards

WHEN a shortage of ties is impending, there are always a few who advocate the relaxation of standards on the ground that such action will increase tie production. It is greatly to the credit of the Committee on Ties of the American Railway Engineering Association that it has stood squarely and emphatically against any such relaxation, contending that it will not alleviate the tie situation, but will result only in saddling the railways with a lot of inferior ties that will give inferior performance and have short service life. The committee contends further that the present volume and character of traffic need the support of a substantial tie condition that can be obtained most economically by the use of longlived sound ties. It is equally to the credit of the association as a whole that it has supported its committee in these contentions fully and consistently.

During 1942 and 1943 there was a marked shortage in the number of ties available for railway maintenance, primarily because the army and navy dominated the market through priorities and price differentials. As a result there was a sharp drop in the number of ties applied in 1943, but as military competition waned, there was a corresponding jump in the number of ties available to the railways, although tie production actually decreased. As a consequence of this greater supply, there was an increase of almost six per cent in the number of ties renewed in 1944, compared with the previous year. It should be kept in mind, however, that none of this increase came about by reason of any relaxation of standards, but through a drop in essential military requirements.

During this period, the most disturbing influence in the tie-producing field, which has overshadowed all other questions, has been the ineffective way in which the O.P.A. has functioned with respect to tie prices, apparently partly through inertia and partly through a complete lack of understanding of the implications of the tie situation. Even after it was informed by the railways, by the producers and by other government agencies that a severe emergency existed, the O.P.A. took time out to make a deliberate survey of the situation before taking action.

Action was announced finally by the O.P.A. on July 21 of a 17 per cent average increase in eastern producers' ceiling prices. This action applies to tie production in all of the states east of the 100th meridian, except North and South Dakota. The increase ranges from 2½ to 20 cents per tie, according to species, size and the area of production, the average being 16 cents per crosstie for the entire territory affected.

. It is problematical what effect this belated action will

have. In the first place, it has come so late that both the railways and producers believe that tie production cannot be stimulated enough by any action to avert a serious tie shortage in 1946. Again, the increase is so much less than producers were expecting that the stimulus to production may not be enough to increase materially the flow of ties to the seasoning yards, where they will be available for next year. Whatever the effect, however, it should be recognized by all concerned that a relaxation of standards will not better the situation.

Anti-Creepers—

Are Essential on Many Yard Tracks

AS the track forces complete their main-line rail laying programs and turn their attention to laying much of the released rail in secondary main lines and yards to replace rail of lighter section, it is important that the application of anti-creepers in yard tracks, where necessary, be not overlooked. On some roads, it is not customary to apply anti-creepers on any yard tracks and on many other roads there is a tendency to apply an insufficient number. This is a mistake, particularly in the case of such tracks as the leads and ladders of important yards and terminals.

In most modern yards, many tracks, such as those in receiving yards, over humps and in classification and departure yards, carry traffic constantly in one direction. This preponderance of movement in one direction is certain to cause rail creepage if a sufficient number of anti-creepers are not applied to control it, resulting in slued ties, uneven surface and gage, frogs out of line, tight gage at frog points, a poor fit of the switch points against the stock rails, and switch rods that bind on or are too close to the head blocks, with consequent stiff operation of switches. All of these conditions add to the cost of yard maintenance, and many of them, directly or indirectly, increase the possibility of derailments, which, under present conditions, may be much the more serious in terms of operating delays and the needless use of man-power.

Fortunately, most types of anti-creepers can be removed and reapplied on second-hand rail when it is relaid. Furthermore, in most cases, sufficient anti-creepers can be recovered from the old rail when main-line tracks are relaid, so that no additional cost is involved for material in properly anchoring the rail in its new location. But even if sufficient anti-creepers cannot be recovered for reuse, the advantages of applying an adequate number of them on leads, ladders and other important yard tracks that require anchorage are important enough to justify the expenditure for new anti-creepers to the extent necessary to hold the rail fixed in position. This is a matter that should be receiving serious consideration.

This Emblem Stands for Honorable Service to Our Country

All men and women who are honorably discharged from the armed forces, including thousands of returning railroad employees, will wear this lapel button. Remember, they have served America well, and so helped protect the things you love—your home, your family, your freedom. Join in saying to them, "Well done and welcome home".

Stabilization—

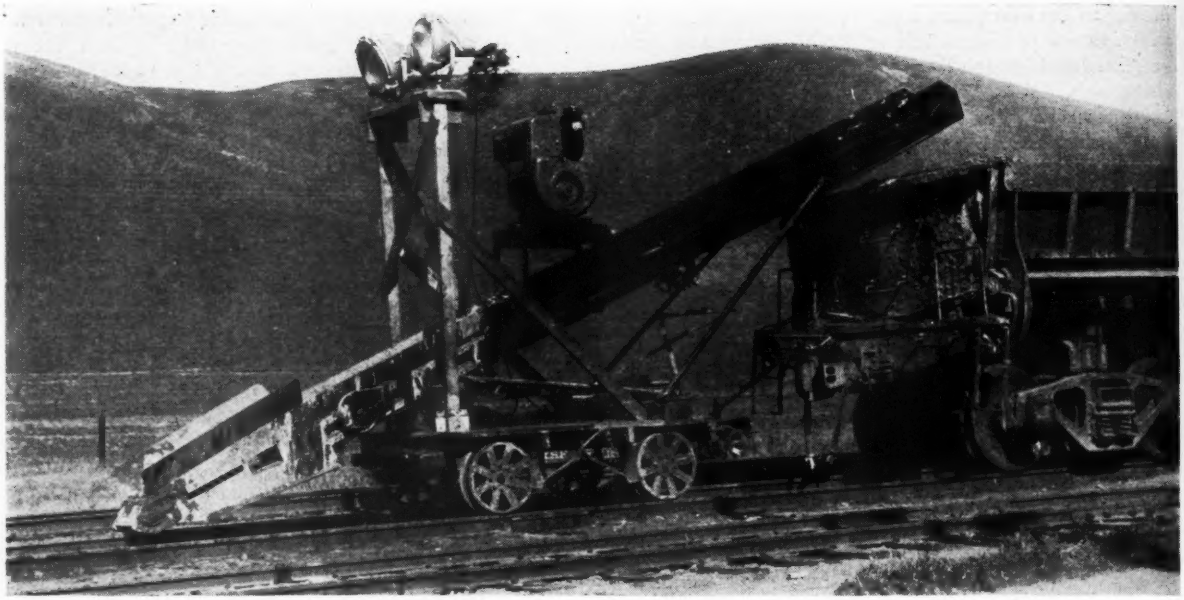
Of the Roadbed Will Show a Profit

WHERE the roadbed is not stable or track drainage is poor, effort should be made to correct the defect, for neither of these conditions will improve automatically; in fact, the longer they are neglected the worse they become, and this deterioration is relatively rapid under a high traffic density, especially if it is combined with high-speed operation. Defective track drainage almost invariably results in unstable roadbed eventually, unless measures are taken to correct the condition. Drainage is and has always been essential to stable roadbed, so that, in the main, it offers a cure for both unstable roadbed and track. However, roadbed stabilization is not always simple.

It should be emphasized that drainage is essential to the stability of the roadbed, despite the fact that numerous roads are now engaged in a form of roadbed stabilization by grouting that seems to contradict this statement. If the matter is analyzed, however, it will be found that the statement is still true. In other words, while drainage involves the permanent removal of water from the roadbed, that is what grouting likewise accomplishes or attempts to accomplish, while going somewhat further. Furthermore, it accomplishes its purpose somewhat differently, for instead of continuing to draw off water that may reach the roadbed from any source, the grout displaces the water already in the roadbed and prevents more water from gaining access to it, except through underground seepage. In the latter event, it may be necessary to forego the grouting in favor of drainage or to undertake both expedients.

Although roadbed and track stabilization have always been desirable, there has never been a time in railway ristory when they were more necessary than at present. Yet, this situation exists simultaneously with the most acute shortage of labor in railway history, so that some maintenance officers have expressed inability to see how they can undertake stabilization work when they are already severely short of track labor.

When it is considered, however, that the smaller amount of labor needed to maintain track on a stable roadbed will far more than offset the labor expended in the stabilization work, the present shortage of labor, severe as it admittedly is, scarcely becomes a consideration.



Ballast-Loading Conveyor Attached to Magor Dump Car

Replaces Track in

This article describes an unusual solution of the difficult problem of renewing ties and ballast in a single-track tunnel on a busy line. Handicapped by the shortage of labor, which is particularly acute on the Pacific coast, the Santa Fe has mechanized the operation to the practical limit and, working closely with the operating department, the engineering department has been able to make excellent progress on what is at best a slow operation.

ONE of the important tunnels on the Atchison, Topeka & Santa Fe, commonly known as the Franklin tunnel, is located about 15 miles east of Richmond, Cal., where the line between Barstow, Cal., and Oakland, passes through the Coast range. The bore, which is single-track and 5,600 ft. long from portal to portal, passes through difficult ground, and trouble with water had been experienced from the date of its completion until 1937, by which time its concrete lining had deteriorated to the point where major repairs became necessary.

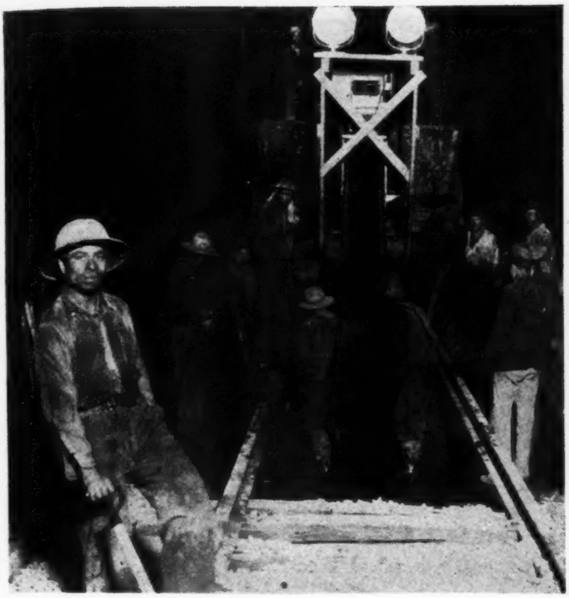
During part of 1937, and extending well into 1938, the disintegrated concrete was cut out and replaced with shotcrete, after which the remainder of the lining was consolidated by pressure grouting. While this work was quite successful in correcting leakage through the tunnel lining, there were some detrimental accompanying effects in that it was impossible to protect the ballast fully during the progress of the work, and some of the waste from the several operations was added to the debris that had accumulated from traffic and the leaching action of the water prior to making the repairs. As a result, the ballast had become fouled quite badly and the need for a complete renovation of the track became apparent.

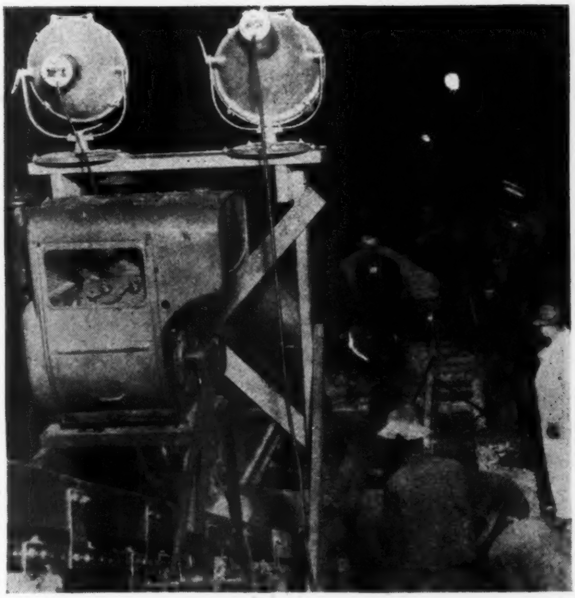
Accordingly, a plan was formulated for replacement of ballast, ties and rail. In programming this work, the shortage of labor made it desirable to avoid manual effort and to substitute mechanical equipment so far as practicable. It was also planned to replace the 90-lb. rail then in service with the 112-lb. section, but to confine the initial operation to replacement of the ballast and ties, laying heavier rail as a later and separate operation. It was impracticable to take the tunnel out of service at any time while the improvement program was under way, since there was no alternate line available for rerouting trains. However, through co-operation with the operating officers, it became possible to arrange for relatively long periods during which on-track equipment could be used.

Work was started about midway between the portals, at which point there is a summit with light grades descending toward each portal. The work is now in progress toward the west portal, where secondary trackage to serve the operations is available and where a suitable labor camp has been located.

To facilitate the work, a 380-hp. General Electric Diesel-electric switch engine has been assigned to the job, which has already paid large dividends because of the flexibility of the work-train movements and the absence of concentrated fumes which a coal-burning locomotive would have produced. This locomotive does, of course, emit fumes containing carbon-monoxide and other gases, which are augmented by the exhaust from several small gasoline engines that drive various units of the mechanical equipment. To protect the men working in the tunnel from these gases, the normal east-to-west draft through the bore is supplemented and accelerated by a 6-ft. blower driven by a V-belt from a Hercules engine. This outfit is mounted on a flat car which is coupled to the west, or away-from-the-work end of the locomotive, and so far has been effective in providing the needed ventilation.

Coupled to the other or east end of the locomotive is a side-dump Magor ballast car, where it will be between the locomotive and the work of removing the dirty ballast. Lightly coupled to the free end of the bal-





Above Left—Loading the Foul Ballast on the Conveyor—Note the New Ballast and Ties. Above Right—Placing the New Ballast After New Ties Have Been Installed—Note the Upturned Push Cars. Below—Work Train Without Conveyors—Extra Car Is Fitted With Seats for Hauling Gang

Long Tunnel

last car by a long tie rod, there is an ordinary section push car which serves as a mounting for a belt conveyor that is driven by a gasoline engine. The conveyor is so inclined that while the lower end has a slight clearance above the ties, the upper end delivers material over the end of the ballast car.

Work is begun by digging out the old ties and shoveling the foul ballast onto the lower end of the conveyor, which is equipped with suitable side shields. Four MT3 Ingersoll-Rand pneumatic tie tampers fitted with cribbing forks are employed to loosen the ballast, the air for these tools being provided by a Spottamper carried on the car which mounts the ventilating blower. All of the old ballast is removed down to the concrete invert of the tunnel, which ranges up to 30 in. below the base of rail. To provide working space and thus simplify the operation, the ballast and ties are removed from a panel of track at one time, the work train, with its conveyor, backing away from the stripped track as the work progresses, leaving the exposed section available to other forces inserting the new ties and ballast. The old ballast is used to widen embankments in the vicinity of the work and usable ties removed are employed as replacements for ties removed from sidings.

As the removal of the old ballast advances, new ties and fresh stone ballast are trucked into the tunnel from the east, or head end of the work, by means of push cars, which are handled by a three-speed Fairmont motor car. This arrangement permits the work of rebuilding the track to be kept up close behind the stripping operations, a feature which has proved particularly desirable to shorten the time required to close up the track when a scheduled train is due or when any uncertainty exists concerning clearance for an extra train. As each car is emptied, it is cleared from the track by tipping it against the wall of the tunnel. When all of the ties and new ballast have been unloaded, the cars are restored to the track and are loaded with old ties for removal from the tunnel.

The tunnel is wired for light, but the additional light necessary to illuminate the work sufficiently to allow the men to work effectively is provided for the working area by two floodlights. These lights are supplied with current by a Homelite generator, which is also carried on the flat car that mounts the blower and the compressor.

Mexican labor is employed to advantage, since there is less turnover than with native labor on work

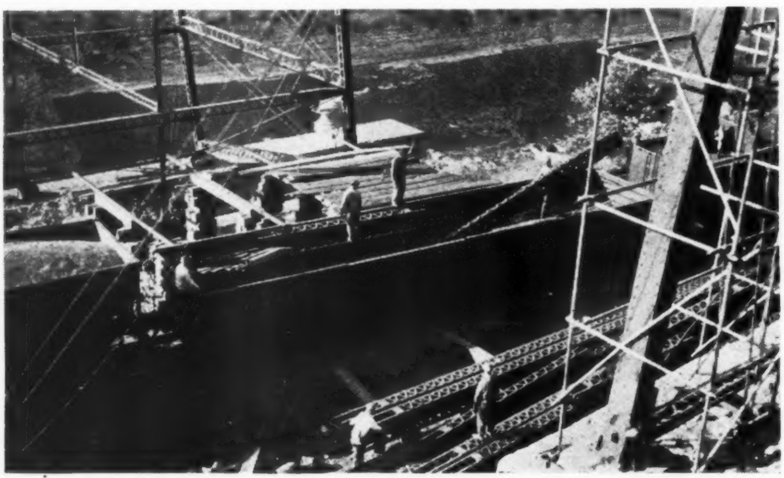
(Continued on page 780)

Strengthening Old Viaduct

By A. M. KNOWLES

Engineer of Structures (Retired), Erie*

THE picturesque and historic 70-year-old, 818-ft. viaduct of the Erie over the scenic Genesee River gorge at Portage, N. Y., has recently been repaired and reinforced to permit it to carry the heaviest steam locomotives on the system. In carrying out this work, which was confined entirely to the towers, many difficult problems were encountered, partly because of the nature of the repairs required and partly by reason of the extreme height of the towers, the tallest of which are nearly 200 ft. high. Among the more interesting features of the project were the use of cantilever erection trusses for hoisting material up the inclined sides of the towers, and the conduct of the work on the highest towers with the aid of scaffolding of steel-tubular construction.



Unloading New Material From a Pennsylvania Train Underneath the Viaduct

Top of One of the Towers, Showing the Erection Trusses that Were Used in Hoisting Material Up the Inclined Sides of the Towers

The first structure that was built to bridge the gorge at this location was of a very different character than the present one. The building of this section of the railroad was begun in the early 1850's when native timber was more plentiful than structural iron, there being large quantities of it available at the site. Consequently, a massive wooden viaduct was chosen for the crossing, which was completed on August 16, 1852. This viaduct, built to accommodate a single track, was 850 ft. long, and incorporated seventeen 50-ft. spans rising a maximum of 234 ft. above the river.

Destroyed by Fire

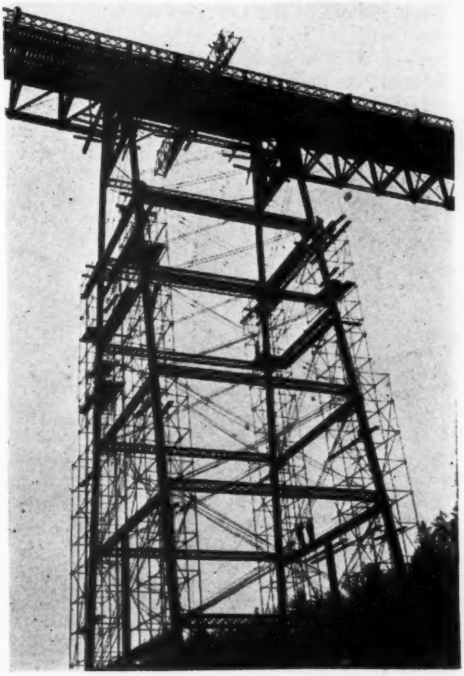
However, disaster over took the original bridge on May 6, 1875, when its superstructure was completely destroyed by fire. No time was lost by the company in replacing the destroyed bridge. On May 10 a contract was awarded for the iron work of a wrought-iron viaduct to take its place, utilizing parts of the original masonry substructure. The viaduct was formally tested on July 31, 1875, and immediately opened to traffic. This was a single-track structure although it was so designed that it could be altered without great expense to accommodate a second track. More specifically, the truss spans were designed to carry only one track with the idea that they could be doubled up if it should be desired to add a second track in the future. The towers, however, were made of sufficient general dimensions and strength to accommodate a second track.

As originally constructed, the wrought-iron viaduct contained 13 spans, of which 10 were 50 ft. long, two were 100 ft. in length, and one was 118 ft. long, making a total length of 818 ft. The track grade was 203 ft. 8 in. above the tops of the foundation piers in the river. The spans consisted of pin-connected deck trusses, placed on 20-ft. centers, which were supported directly on the columns.

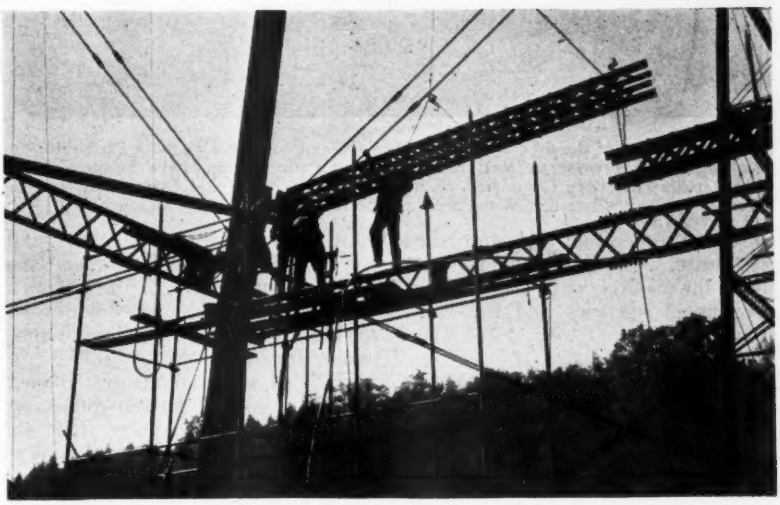
*Temporarily, Mr. Knowles' address is 1160 Fifth Avenue, New York, N.Y.

Proves Big Task

This is the story of how the Erie reinforced the towers of its 818-ft. viaduct across the Genesee River gorge at Portage, N.Y., to permit materially improved train operation on its Hornell to Buffalo line. With the towers rising to a maximum height of nearly 200 ft., the work of strengthening them proved difficult and complicated, and had to be carefully planned and executed. However, the procedure adopted made use of a number of innovations that were found exceedingly helpful.



Right—One of the Towers, With the Pipe Scaffolding in Place for Nearly Its Full Height. Below—Inserting a Portion of One of the New Transverse Struts



By 1903 the sizes and weights of locomotives and cars had increased to a point which made it necessary to undertake certain alterations in the viaduct to permit it to accommodate them. In this work all the wrought iron truss spans were replaced with steel construction which included deck plate girders for all the 50-ft. spans and deck-type pin-connected trusses for the 100-ft. and 118-ft. spans. Both the trusses and the girders were placed on 14-ft. centers and were supported on new header girders installed between the tower columns for this purpose.

Following the strengthening of the viaduct as described, it remained adequate for some years to carry the loads imposed, but gradually was again out-distanced by the increasing weights of cars and locomotives, with the result that eventually it became necessary to require that the speeds of most trains be greatly reduced when passing over the viaduct. In addition, when freight trains were double headed it became necessary to cut off the lead locomotive and move it over the viaduct in advance of the balance of the train.

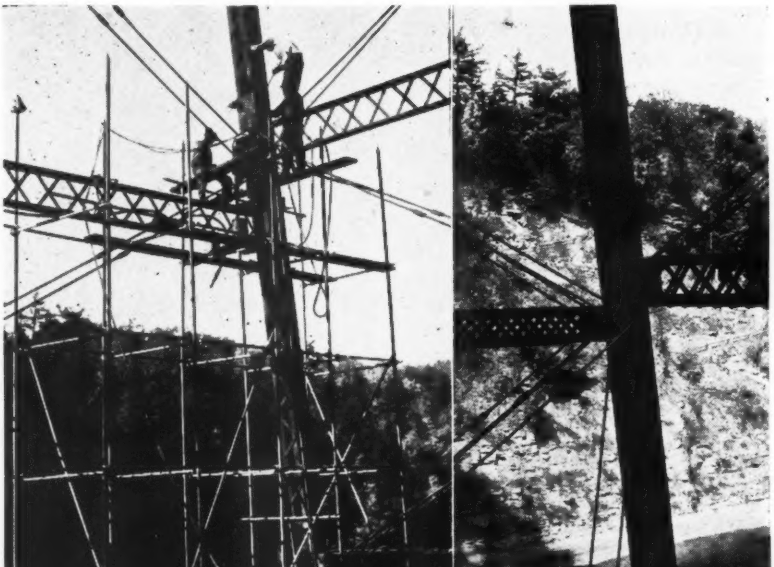
Heavier Locomotives

To help cope with the greater burden of traffic that was being imposed on it, the Erie recently purchased six 5400-hp. Diesel-electric locomotives for use on the main line between Meadville, Pa., and Marion, Ohio, which is a territory of relatively heavy grades. When these locomotives went into service a considerable number of steam locomotives weighing 423 tons each were released for use on other parts of the railroad where they could be employed to good advantage in relieving power shortages. One such section of the road was the Buffalo division, which extends between Buffalo, N.Y., and Hornell. However, there were three bridges on this division that were inadequate in their existing condition to handle the heavier locomotives. Among these was the viaduct at Portage, and before the heavier locomotives could be placed in service it was necessary to undertake an extensive strengthening program involving this viaduct.

Since the existing bridge at Portage was a single-track viaduct in double-track territory, and because the 70-year old supporting towers were considerably worn in some of their vital parts, plus the further fact that the existing line contains heavy grades in the vicinity of the structure, a new double-track viaduct, with a grade line at a higher elevation than the old one, was considered desirable. However, in view of the difficulty of obtaining a priority to proceed with a project requiring such a large amount of steel, it was decided to undertake a program for reinforcing the existing structure.

Certain parts of the viaduct, including the main girder and truss spans and the header girders, were adequate without change to carry the heavier power, but practically all of the tower members, especially those in the high towers and in the low bents supporting the truss spans, were in need of attention. In general, the wrought-

iron members of the towers were well preserved and in good condition, except for wear at the column joints, at the strut connections to the columns, and of the cast iron column bases and the roller nests under them. With only about 275 tons of new steel being required to recondition and strengthen the towers, the necessary authority to obtain the material was obtained from government agencies and the work proceeded.



Left—Placing One of the 6-Ft. Lengths of New Cover Plates on a Column Preparatory to Installing a New Transverse Strut. Right—A Panel Point in One of the Tower Columns After Repairs Had Been Completed. Note New Struts, Additional Brace Rods, and the Cover Plate that Was Placed on the Inside Face of the Column

Tower Details

Before giving details of the reinforcing work it will be helpful, in the interests of a better understanding of the problem involved, to describe briefly certain details of the existing towers. For instance, the tower columns, which were built in 25-ft. lengths (the same as the height of the tower panels), were each constructed of four 4-in. by 4-in. by $\frac{1}{2}$-in. angles with two 15-in. side plates, varying from $\frac{5}{8}$ in. to $\frac{7}{8}$ in. thick, and an outside cover plate 16 in. wide and varying from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. thick. The inside faces of the columns were laced and battened. Each of the longitudinal structs, which were 50 ft. long, was composed of four $2\frac{1}{2}$-in. by $2\frac{1}{2}$-in. by 5/16-in. angles placed in pairs and laced, the distance between the backs of the angles being 1 ft. $11\frac{1}{2}$ in. These had $\frac{1}{4}$-in. by 12-in. cover plates top and bottom.

Except for the bottom members, the transverse struts consisted of three different sections similar in composition to the longitudinal struts, except that they varied in depth from 8 in. to 18 in. and in length from 20 ft. to 64 ft. All of the tower bracing consisted of $1\frac{1}{4}$-in. rods in pairs, with the rods having loops at the ends for engaging pins through the columns. All the rods were equipped with turnbuckles near each end and were upset at the threaded ends.

Each of the columns rested on a cast-iron pedestal with an offset extending up into the column shaft, the pedestals under the north columns of each tower being secured by dowels to cast-iron masonry plates anchored to the masonry, while those under the south columns were supported on roller nests in which the direction of movement was at right angles to the axis of the viaduct. To take the thrust due to the inclination of the columns, the pedestals were connected by eyebars, and to resist the inward thrust due to the tension in the diagonels they were held apart by struts provided with wedges for adjustment.

The two highest towers in the viaduct each had two intermediate longitudinal struts in the plane of the second and third transverse struts, together with a system of diagonal rods to stiffen them. All the struts were stiffened by angle braces placed diagonally at the tower columns, each of these braces being fastened to the adjacent struts at points 10 ft. from the column.

The column splices consisted only of two 6-in. by $\frac{1}{2}$-in. tenon plates at each joint, which were intended to hold the adjacent sections in line. Dependence for strength at the joints was placed mostly on the square-faced ends of the columns and the effectiveness of the struts and brace rods.

While the transverse struts were directly connected to the columns by means of $1\frac{7}{8}$-in. pins, the longitudinal struts were made with square ends to butt against the web plates of the columns and were fastened to them only by bolted connections at the top and bottom flanges. These connections had become badly worn. At some of the column bases having roller nests, the bases had broken in several places outside the column shafts due to the fact that the rollers had worn unevenly.

What Was Done

The desired increase in tower strength was achieved by a number of different measures. For instance, all columns in the high towers, and in the bents of the shorter towers supporting truss spans, were reinforced by replacing the lacing and batten plates on their inside faces with 18-in. by $\frac{5}{8}$-in. plates With the exception of the top and bottom transverse struts, a few longitudinal struts installed since the viaduct was built, and certain other struts in the shorter towers, all struts were renewed with more effective sections to resist buckling and vibration. These new struts were riveted to the columns and the original angle braces at the corners of the towers were removed. The existing diagonal brace rods were retained and as many more diagonal rods, double-looped, $1\frac{1}{8}$ in. and $1\frac{1}{4}$ in. in size, were added where new struts were installed, being connected to pins provided in the ends of the new struts.

In addition, the old roller nests were removed and practically all the masonry plates were replaced with larger ones to secure a larger area of distribution over the masonry. In place of the rollers, slide bearings were provided at the bases of the columns consisting of steel plates with bronze-treated surfaces.

Designs

The designs for the strengthening work and the necessary shop drawings were made by the company's engineers, and the fabrication and erection of the material was carried out by the road's bridge forces. The plain

steel items requiring simple fabrication were shipped from the mill directly to the bridge site. These included the long cover plates for the columns, on which the field work consisted of cutting them to the length and beveling them for butt welds, and the straight portions of the brace rods, on which the work consisted of cutting to length, beveling for butt welds and welding to threaded turnbuckle stubs. The balance of the material was sent to the company's steel bridge repair shop at Port Jervis, N.Y., where it was fabricated and shipped to the bridge site as required.

All of the steel used in the reinforcing work was delivered to the job over a branch line of the Pennsylvania which occupies an abandoned canal bed under the viaduct. Freight trains were stopped long enough to unload one car at a time, except on two occasions when materials were delivered by work train. The unloading work was accomplished with the aid of air hoists placed at the ground level, with the cables extending through sheaves attached to the viaduct span over the railroad track.

Erection Trusses

The hoisting of all material for erection purposes was handled with the aid of four utility air hoists and one gasoline hoist located at the ground level under the viaduct. The new struts destined for installation on the inclined sides of the towers were hoisted into position by means of cables extending through sheaves attached to specially-designed cantilever erection trusses placed at the tops of towers. These trusses, which were fabricated at the Port Jervis shop, extended out 32 ft. from the center of the track in both directions from the viaduct, and incorporated means for connecting the hoist sheaves to them at 5-ft. intervals. As the reinforcing work on each tower was completed the erection trusses were moved forward to the next tower. Material for installation on the vertical (or transverse) sides of the towers was hoisted by means of cables extending through sheaves attached to the under sides of the viaduct spans.

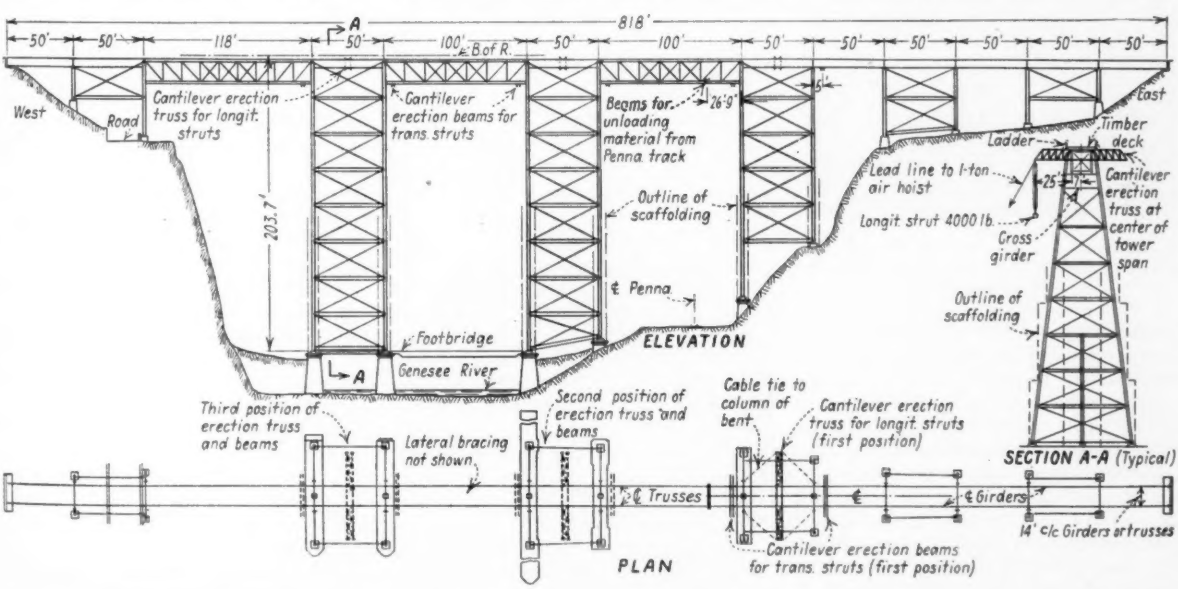
Definite advantages in carrying out the work on the three highest towers were realized by using scaffolding consisting of pre-fabricated tubular members with special clamps for fastening the members together at the joints. Scaffolding of this type was used for the full height of the three towers. Platforms of timber planks were placed on the towers as needed and steel ladders were used to give access to them. The pipe scaffolding, which was supported on the masonry piers, provided stable and substantial working platforms for the men and tools at any desired level. This proved to be an important asset in carrying out the work.

The air compressors and welding machines required on the project were located on the ground at the level of the Pennsylvania track, and the air and welding lines were run to the various parts of the job as needed. The air lines were extended up the sides of the towers, with take-offs at convenient locations. The supplies of oxygen and acetylene required for cutting work were located on the viaduct at the track level and the hoses were dropped down in the center of the tower to the level desired. From this position the hoses could be pulled over to any desired location on the tower, thus precluding the necessity of dragging them around, through and over the scaffolding and the steelwork.

To permit the foreman to communicate instructions from the ground level to his men in the towers, even though the compressors and welding machines might be running, portable telephone instruments were used effectively.

No Traffic Interference

Since railroad traffic over the viaduct was not to be interrupted at any time during the progress of the work, the alterations at the viaduct towers had to be made with care and in accordance with a definite sequence. One of the most critical operations was the removal of the old struts and their replacement with new ones in substantially the same location. Because of the inadequacy of the existing joint splices, the stability of the old columns depended to such an extent on the effectiveness of the struts and brace rods that at no time could a strut be removed until a substantial temporary strut had been installed in an adjacent position. When the first struts were removed the columns were stayed by temporary heavy wood braces supported on the ground. Afterwards, these and other old struts that had been removed were utilized as temporary struts between the col-



Elevation, Plan and Cross-Section of the Viaduct, Showing Locations of Erection Trusses and Beams and Certain Other Information Relative to the Reinforcing Work

umns in both the longitudinal and transverse directions. When installed as temporary struts, these members were bolted rigidly to the columns to prevent their springing in any direction when the old struts were disconnected and removed.

In carrying out the fabrication work the new longitudinal struts were made full length as no difficulty was expected in making the field connections of these members to the vertical faces of the columns. However, the transverse struts were each fabricated in two pieces and were field spliced at the center. This was done to facilitate erecting them between the inclined faces of the columns and the existing brace rods, and to afford means of adjusting their length to some extent to fit the different conditions existing at each point.

Installing Cover Plates

Another critical operation was involved in the installation of the cover plates on the inside faces of the columns at the locations of the connections for the transverse struts. This operation was complicated by the fact that the ends of the original transverse struts were each filled with a casting to engage the 1⅞-in. pins through the columns to which the transverse brace rods were connected, and it was not desired to disturb these brace-rod connections during the changing out of the transverse struts and the application of the new cover plates. Hence, in preparation for installing the new cover plates in the vicinity of the connections for a particular transverse strut, the first operation was to install a temporary strut and then to remove the existing strut by cutting out the castings in such a manner as not to disturb the 1⅞-in. pins in each column. The procedure followed after this had been done was to cut off the lacing and batten plates on the inside face of each column for a sufficient distance to take a 6-ft. length of the new cover plate; remove the inside nut on the pin through the column connecting the longitudinal brace rods and slip off the inside brace rods after slacking off the turnbuckle; install the 6-ft. section of the cover plate over the projecting pin, and then replace the brace rod. All of the work involved in this procedure was done under traffic except during the interval when the longitudinal brace rods were disconnected, when the work was done between trains.

A Repaired Column Base in Which the Existing Roller Nest Has Been Replaced with Slide Plates

When applying the 6-ft. lengths of cover plates at the strut connections, these members were riveted in place, utilizing the existing holes in the columns. When the new transverse struts were applied they were riveted through the new cover plates. When the remaining parts of the new cover plates were applied to the inside faces of the columns they were welded to the outstanding legs of the column angles by means of continuous fillet welds, and were butt-welded to each other and to the 6-ft. plates. The existing rivet holes in the tower angles under the new plates were plug welded. As part of the repair work on the columns, the adjoining ends of these members at the joints were brought into line and 14-in. by ½-in. splice plates were riveted to the inside faces of the existing side plates.

New Brace Rods

As already indicated, the reinforcing work involved the installation of new double brace rods at all locations where new struts were applied, these being in addition to the existing brace rods which were retained. The new rods, which were installed between the existing rods straddling the columns, were looped around new pins provided in the gusset plates connecting the new struts to the columns. Each of the new double brace rods contains four turnbuckles for use in adjusting and tightening the rods.

All the new struts applied in the reinforcing work were shop riveted, except that the lacing was electric-welded at the intersections, this work also being done in the shop. Rather than being provided with nuts, the pins in the new struts were field welded to the gusset plates in those members. To facilitate installation of the new brace rods, some of the end batten plates on the new struts were omitted in the shop work, being field welded in position after the brace rods had been installed. The turnbuckles for the new brace rods were purchased with threaded rod studs which were butt-welded to the looped portions of the new brace rods in the shop, and to the straight portions of the rods in the field. Since there are about 1,500 new and existing turnbuckles in the bracing, their adjustment in the field constituted a major undertaking.

Foundation Work

With reference to the repair work involving the foundations of the towers, two of the stone pedestals under the columns of one bent were in a broken condition and were not suitable to take the new larger masonry plates that it was desired to install. It was necessary, therefore, to repair these pedestals before the new masonry plates could be installed. To permit this work to be carried out, each of these columns was supported on temporary needle girders and beams of sufficient strength to carry both the dead and live loads. When this had been done the defective masonry was cut out at each pedestal and an Embeco concrete pad, about 6 in. thick, was cast on the existing masonry at an elevation to permit a fabricated I-beam grillage to be installed under the column base. The grillage was then encased in concrete.

At the other locations where larger masonry plates were installed, the columns were each raised temporarily a sufficient amount to permit the old plates to be removed and the new ones to be installed. This operation was performed with the aid of two 50-ton jacks placed on suitable supports and bearing against steel brackets attached to the column. The work of changing out the masonry plates was done between trains and the temporary supports were made only of sufficient strength to carry the dead load of the structure.

This project was carried out under the general supervision of J. W. Smith, chief engineer of the Erie, and was supervised directly by the author, then engineer of structures and now retired. He was assisted by H. A. Dise, then assistant engineer of structures and now engineer of structures, A. A. Visintainer, then assistant engineer and now assistant engineer of structures, and William K. Manning, supervisor of bridges. G. E. Elower was the foreman in charge of the bridge gang, and A. K. Stauffer, general inspector, inspected the work.

Maintaining Water Service Facilities—

PIPE LINES

Part II

By C. R. KNOWLES
Superintendent Water Service (Retired)
Illinois Central, Chicago

Applying a Protective Coating with Wrapper to a Pipe Line

No. 13 of a Series

This is the second part of a two-part installment dealing with the maintenance of the various types of pipe lines employed in railway water service. In it the author discusses primarily chemical and mechanical means of cleaning lines, corrosion, electrolysis, protective coatings, means of preventing damage from freezing, and methods of thawing. Part I treated essentially the classes of pipe lines, the detection of leaks, the making and repair of joints, and the causes of water hammer.

A REDUCTION in the flow or carrying capacity of pipe lines is frequently encountered in the operation of railway water stations. This is evidenced by an increase in pressure to deliver the required amount of water, or the inability to secure a normal flow at abnormal pressure. A pipe line in good condition should deliver a given amount of water with a friction loss not exceeding 5 per cent of that in new pipe, as shown in any good table of friction losses in pipes.

A reduction in the carrying capacity of pipe lines may result from any one of a number of causes, the most common being incrustation on the interior of the pipe. With the exception of deposits from treated water, incrustation appears to be dependent to a large extent upon the pipe becoming rough from corrosion; mud or lime is then deposited, forming a bed for the growth of bacteria.

One of the best known forms of bacteriological growth in pipe lines is Crenothrix, although there are various other growths commonly known as pipe moss, pipe sponge and clay rust scale. It is claimed that these organisms will not thrive in a water that is not acid and that rendering the water alkaline will overcome the trouble. Iron and manganese promote the growth of Crenothrix. Mud and suspended matter seldom collect in pipe lines to the extent that they restrict the flow of water, unless the deposit becomes caked and cemented by other deposits, such as with the precipitation of solids from treated water. In the case of pipe lines subject to infrequent use, such as in fire protection systems, the pipe can usually be flushed through fire hydrants or other openings. Likewise, any sediment present in active pipe lines can usually be removed by flushing the line or by reversing the flow. To permit the former, blow-off valves should be provided at low points in the line or elsewhere where these deposits are likely to occur.

An Extreme Example of Incrustation in a Pipe Line

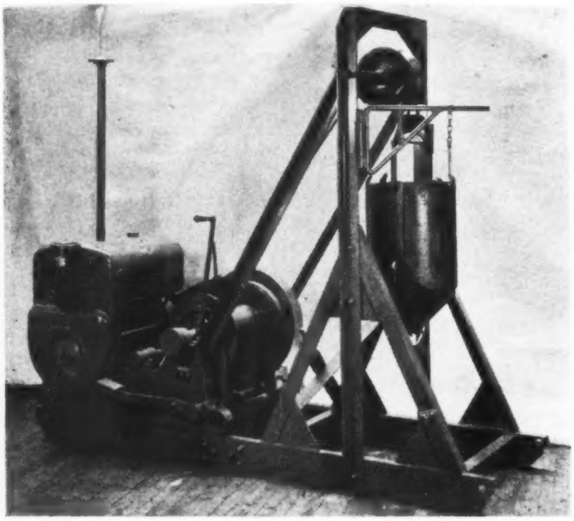
Blow-off valves should be operated at regular intervals. For best results, short intermittent blows are more effective in removing sediment than long continued operation. Quick-opening valves are more desirable than the ordinary threaded stem valve, but care should be exercised to prevent undue shocks or water hammer when they are used in long pipe lines. Ample drainage should be provided to dispose of the waste water and sediment blown off. If the sediment becomes caked and hard, there is no other recourse than to clean the pipe by mechanical or chemical means, as with other incrustations.

The incrustation of pipe lines carrying treated water is by no means uncommon, particularly where the water is undertreated or where treated and untreated water are mixed in the lines.

This condition is aggravated where the water enters the line before the chemical reactions are completed, as happens frequently where a treating plant is operated beyond its capacity.

The velocity of flow through the pipe line also has an effect on the form of the precipitate. High velocities prevent the deposition of suspended matter, but tend to accelerate incrustation where matter in solution passes into suspension, as in the case of after-precipitation in treated water. On the other hand, extremely low velocities permit mud or suspended matter to settle out and accumulate in the pipe. Filters are a decided help in preventing deposits in pipe lines, especially where treated water is used.

Incrusted and dirty pipe lines can be restored to approximately the carrying capacity of new pipe lines by cleaning. Three methods are followed in cleaning pipe: (1) by hand; (2) by the use of chemicals; and (3) by mechanical methods. The cleaning of pipe by hand is limited to short lengths of pipe and to comparatively soft deposits.



Power-Driven Winch Designed Especially for Use in Cleaning Pipe Lines. Note Cleaning Tool Attached.

Chemical Method

The chemical method of cleaning pipe lines is used quite extensively, especially where incrustation forms from the passage of treated water through the pipe. In the chemical method of cleaning a dilute solution of commercial hydrochloric acid is circulated through sections of the pipe until the incrustation has dissolved.

In the chemical method of cleaning, when done by railroad forces, a storage tank for the acid solution is provided with a capacity equal to about three times the capacity of the pipe to be cleaned. The acid solution is piped to one end of the pipe to be cleaned and is discharged from the other end into the solution tank. Frequent checks are made of the acid solution as the work is carried on and fresh acid is added as required to maintain its strength. Tests are made of the acid strength with methyl orange solution, or by noting the absence of gas bubbles in the solution as discharged from the line.

Opinions differ as to the most effective solution of water and acid. One railroad recommends a 50 per cent acid solution while another recommends a strength as weak as 8 per cent. The latter is probably more nearly correct, because while it will require more time to clean the line, it will prevent a violent reaction and the rapid formation of gas, with attending difficulties of control. An inhibitor generally consisting of tannins is used with the solution to prevent the acid causing damage to the pipe, valves and fittings.

The cleaning of smaller pipe lines, such as boiler-feed lines, valves and fittings, feed-water heaters and short service lines, is comparatively simple. The larger and more extensive pipe lines present a more difficult problem, however, and the railroads seldom have adequate equipment to do this work. Therefore, where large diameter pipe is involved, it is usually less expensive and more satisfactory to contract the work to concerns that specialize in such work.

Mechanical Cleaning

The mechanical cleaning of pipe lines is widely used and is generally faster and more economical than any other method, especially on long lines. The cleaning tools used in this method are equipped with specially designed scrapers and cutters for removing the incrustation. The cleaning tools are attached to wire cables and are forced through the pipe by water pressure alone or are pulled through by means of a hand or power winch with the assistance of the water pressure. The incrustation is washed ahead of the cleaning tool by water passing through the cleaner.

In the process of cleaning, openings are made in the pipe line at each end of the section of pipe to be cleaned. A small cable and carrier are inserted in the pipe at the temporary opening nearest the supply and the opening is then closed, except for a small amount to permit the passage of the cable. With the pressure then applied, the carrier and cable are forced to the next opening.

With the small cable through the pipe, it is then used to pull a larger cable through. The cleaning tool is then attached to the cable, inserted in the pipe, and the opening closed. Following this, the water pressure is applied and the cleaner is forced through the pipe by the pressure, or is pulled through by the winch, assisted by the water pressure. Sections of 1,000 ft. or more may be cleaned by this method at one operation, depending upon the number of bends and the amount and nature of the incrustation. There are a number of pipe cleaning concerns who will furnish the equipment and the necessary supervision for this class of work at a specified rate per foot of pipe cleaned.

Corrosion

Protection against corrosion is an important factor in pipe line maintenance. Particular emphasis should be placed upon the protection of underground pipe lines, but it is in many instances of equal importance that protection be afforded pipe in service above ground. The corrosion of cast iron pipe is negligible when laid under good soil conditions and where it is not subject to electrolysis from stray currents. Next in order in its resistance to corrosion from soil conditions is genuine wrought iron pipe, while steel pipe is readily susceptible to underground corrosion unless properly protected.

The principal cause of corrosion of railway water service lines is cinders. Under no circumstances should pipe of any kind be laid in cinders or in soil containing an appreciable amount of cinders. Even cast iron pipe will have a relatively short life in contact with cinders or ashes. Where it is necessary to lay pipe through a cinder fill, every precaution should be taken to protect it against cor-

rosive action. In addition to providing a protective coating for the pipe, the trench should be backfilled with clay or other non-corrosive earth that will prevent the acids from the cinders from coming in contact with the pipe. There are a number of protective coatings and wrappings on the market that are designed for the protection of underground pipe lines. Their intelligent use will save much trouble and expense in the maintenance of these lines.

Protective Coatings

Among the oldest pipe coatings in common use are the bituminous coatings, consisting of coal tar pitch and asphalt with fillers of various kinds. They are used either as a coating alone or reinforced with fabric, such as burlap or rag and asbestos felt, which are used to increase resistance to abrasion and to retain the coating. The coating may be applied at the time of manufacture or in the field.

Protective coatings with a petroleum base and compounded with rust inhibiting chemicals are a more recent development and have proved very successful. As with bituminous coatings, they may be used alone or with protective wrappers coated with the coating material. Other protective materials include paints, Portland cement and metallic coatings. The selection of a protective coating for pipe lines depends upon a number of factors, such as the location, permanency and accessibility, importance of uninterrupted service, and character of the corrosion.

The Water Service Series

The 12 articles in this series, published previously, include the following:

Electrolysis is a serious form of corrosion that has given much trouble in the maintenance of underground pipe lines. It is caused by return or stray currents from electric railways. The current passes from the rails through the earth to the pipe, and then flows along the pipe with more or less resistance until it reaches a point where the rails or some other conductor are of lower potential than the pipe. The current then leaves the pipe, and in so doing sets up a corrosive electrolytic action. It should be noted that this action takes place where the current passes from the pipe to the surrounding ground, and not where it passes from the ground to the pipe; also that the corrosion is usually more severe where the pipe line is parallel with the tracks than where it crosses the tracks.

Applying Whitewash to Cast Iron Pipe that Has Been Given a Bitumastic Coating and Wrapped

Insulation

Remedial measures consist of insulating the pipe with asphaltic or other insulating material, insulating the joints in the pipe line to break the circuit, or by placing old sections of cast iron pipe or scrap iron in the vicinity of the locations where electrolysis occurs or is suspected. In the latter case, the pipe or scrap iron should be placed on the side of the pipe line in the direction of the current of flow from the pipe line, preferably where the ground is wet, and bonded to it with copper cables. Where this is done corrosion will take place on the "dead" pipe or scrap sections instead of the live pipe.

The protection of pipe lines above ground will also reduce maintenance. Probably the best form of protection for surface pipe lines is to keep them clean and well painted. This is especially true of piping in pump pits, frost boxes and pipe terminals. Enclosed pipe lines, particularly cold water lines, are subjected to dampness and sweating, and unless they are well painted they will rust badly. Paint also adds to their appearance. Rusty, unpainted pipe lines and fittings are not only unsightly but tend to increase maintenance as the result of both deterioration and neglect.

Well-painted unions, flanges and other pipe fittings will also facilitate repairs by preventing bolts and other threaded connections from becoming so badly rusted that they are difficult to disconnect. Also, the selection of certain colors to designate the different services of pipe lines will sometimes eliminate confusion in the operation of valves.

Air Pockets

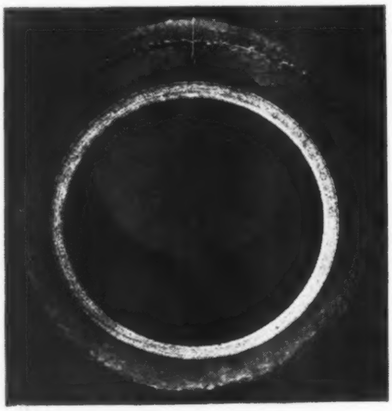
The carrying capacity of pipe lines may be reduced by air pockets forming at the summits of such lines not laid to grade. To avoid the formation of such pockets it is necessary to provide openings for releasing the air. While ordinary valves are sometimes used for this purpose, automatic air relief valves are more desirable. These valves are of various types. A typical design is operated by a float. When the air enters the valve chamber, the float drops, opening the valve and permitting the air to escape. When the air is exhausted, the water enters the valve chamber, raising the float and closing the valve.

Air relief valves should be protected from frost and should be examined at regular intervals to see that they are in good operating condition. Furthermore, all air valves should be provided with cut-off valves to permit their examination and necessary repairs.

Frost Protection

The protection necessary for pipe lines to keep them from freezing will depend upon their location, the size

of the pipe, the velocity of flow and the temperature of the air and water. Frost penetration in some of the extreme Southern states is negligible, while in others it may be as much as ten inches; in the Middle Western and Central states, it may be from 10 in. to 2 ft., and in Canada and the Northern and Mountain states from 6 to 8 ft.



Section of Cast Iron Pipe with a Protective Jacket of Concrete

The depth of frost penetration and its effect on buried pipe lines is not always in direct ratio to the temperature. The freezing of pipe lines is also influenced to a large extent by the degree of saturation of the material around the pipe, whether it is loose or well packed, and the extent of its exposure. Pipe in trenches backfilled with dry material is less likely to freeze than where a wet compact soil has been used. Pipe laid in valleys or in cuts is also less likely to freeze than when located on hillsides or more exposed locations.

The possibility of water freezing in pipe lines is reduced where the flow of water is fairly constant. Also, surface supplies will freeze quicker than water from wells. The temperature of surface water varies with the seasons and is generally very near the temperature of the air. According to R. M. Leggette, ground water geologist, the temperature of ground water at a depth of 30 to 60 ft. will usually have a constant temperature throughout the year of about 2 or 3 deg. higher than the average yearly air temperature of the area in which the supply is located, while the water from wells or other underground supplies in winter is invariably much warmer.

Protection for pipe lines above ground is provided in various ways. A common method is to place the line in a box packed with sawdust. This method is not effective in severe cold climates or if the sawdust is wet.

In some cases a steam pipe is enclosed with the water pipe. In other cases the pipe is protected with hair felt wrapped with tarred paper and enclosed in a box. The thickness of the hair felt and the number of layers to be used will depend upon the size of the pipe, temperature and circulation of the water. Boxing which provides dead air spaces is also effective. It is important that all pipe covering be as air-tight as possible, and thoroughly waterproof. Open fires should never be used to thaw frozen pipe lines where there is danger from fire; thawing should be done with hot water, steam or electricity, where available.

The use of electricity for thawing out frozen pipe lines is followed extensively by municipalities and is coming into more general use on the railroads. A primary requisite in this method is to employ a high amperage and a low voltage. The portable equipment used by municipalities consists of a gasoline-engine-driven generator and other essential appurtenances, mounted on a truck. The various types of portable electric welding outfits used by railroads are well adapted for this class of work. If other facilities are not available, a simple outfit may be constructed, with the assistance of a skilled electrician, using a suitable transformer, a barrel of water and two electrodes for a rheostat, and sufficient heavy copper wire for current and ground.

In thawing pipe electrically, connections are made at two points on the pipe line, with the frozen portion of pipe between the two connections. These connections may be made to hydrants or valves, or directly to the pipe itself by means of suitable clamps or other connections.

The time required to thaw a pipe line will depend upon its size and length. While small lines can be thawed in a comparatively short time, larger lines may require hours, and even days. The power required also varies with the size and length of the line. There are no particular disadvantages involved in thawing pipe by electricity. No precautions are necessary other than those commonly taken when using electric welding equipment.

The prompt detection and repair of leaks in underground pipe lines necessitates the maintenance of accurate plans showing the locations of all such lines. In the absence of such plans, it is often necessary to rely upon the memory of some water service repairman as to the location of specific lines. In spite of the almost uncanny knowledge of some of these men as to the locations of lines, this is not a satisfactory arrangement, because these men, through transfers and changes, are not always available.

The piping layouts at many outlying water stations are comparatively simple and present no particular difficulty in locating them. On the other hand, the underground piping systems at shops and terminals may be quite complicated and present a far more difficult problem. Furthermore, where two or more systems are maintained, as, for example, one for a general supply, a second for domestic use, and a third for a fire protection system, it becomes still more complicated.

Records of underground pipe locations can be readily maintained and kept up-to-date if changes and extensions are platted concurrent with the work. For example, when station maps are prepared or revised, or when additional facilities are constructed, the locations of these facilities can be included at little additional expense.

Leak detectors and devices for locating pipe lines have been used to some extent by the railways with varying success. The simpler forms of such devices, such as the magnetic needle and ear phone, have been used quite extensively and have proved to be very useful instruments. They are comparatively inexpensive and can be readily carried as a part of the water service repairman's equipment. The more complicated and expensive detector outfits of the radio type have been used to only a limited extent by railroads, as they have not proved satisfactory in the vicinity of tracks or near passing equipment.

Track Work in Tunnel

(Continued from page 771)

of this type, besides which the Mexicans are specially suitable for employment on work of this character where there is considerable mechanical equipment. For some time during the course of the work a gang of 25 to 40 men was worked one shift daily. However, since the completion of the camp for laborers, a second shift has been employed.

The work was planned by the engineering and operating staffs in the general manager's office at Los Angeles, Cal., in collaboration with the division staff at Fresno, and the field work is under the supervision of W. R. Johnson, roadmaster.

We are indebted for the information contained in this article to Laurence A. Luther, representative, Ingersoll-Rand Company, San Francisco, Cal.

One of the Three Test Panels of Manganese Castings Installed on the Milwaukee—Note Other Two Panels In Background

Welding Manganese Castings in Special Trackwork

In November, 1942, and November, 1943, a number of manganese test frogs were repaired by arc-welding under the auspices of the American Railway Engineering Association, using various methods and materials, and were later supplemented by a series of laboratory studies. This article presents the background of these tests and a series of tentative conclusions based on them, abstracted from a report of a sub-committee of the Committee on Track of the A.R.E.A., under whose direction the studies have been carried out.*

IN November, 1939, a field test of 24 specially-designed manganese frog castings was installed in one of the heavy-traffic freight tracks of the Chicago, Milwaukee, St. Paul & Pacific near Mannheim, Ill., these castings being arranged in three panels of eight castings each. Similarly, in January, 1942, a field test of 11 solid manganese No. 9 turnout frogs was installed on the Toledo Terminal.

These tests were established as a "proving ground" where different welding techniques and recommended materials could be compared under actual and identical, heavy-traffic conditions. The traffic over the Milwaukee installation is estimated to be from 10 to 15 million gross-tons per year, and that over the Toledo test frogs to be approximately 40 million gross-tons per year.

It was intended, when these frogs became battered, to build them up, using an established program to determine the relative merits of various arc-welding techniques, and a preliminary series of laboratory investigations was conducted to establish a welding program for the tests.

The Milwaukee Test

In the latter part of 1941, it appeared that field welding of the Milwaukee castings would be required in the latter part of 1942, and between November 25 and 30, 1942, two panels of eight castings each were built up by arc-welding in temperatures of 18 to 58 deg. F. The east panel, which did not show as much wear as the other two, was left undisturbed.

The welding program adopted was as follows: Five castings were used to determine the effect of different welding currents and sizes of electrodes, by using a 1/8-in. electrode and 100-amp. current on one casting, by using 3/16-in. electrodes and 100, 130 and 160-amp. currents on three castings, and by using a 1/4-in. electrode with 160-amp. current on another. Four castings were used to determine the effect of different compositions of welding rods by making welds using stainless steel, stainless steel and nickel-manganese, nickel-manganese, and copper-molybdenum-manganese rods. One casting was used to determine the effect of using a cutting torch to cut away part of the point before welding, without grinding, and by cutting the wing and welding after grinding. Another casting was used to determine the effect of welding on a deeply ground surface of the point and wing, to a depth of 1/4-in. Two castings were used to ascertain the effect of the coating on the welding

*F. J. Bishop, engineer maintenance of way, Toledo Terminal, Toledo, Ohio, was chairman of the subcommittee which conducted this study.

rods, by using two types of coated nickel-manganese rods. Finally, one casting was used to determine the effect of peening, by welding without any peening and removing scale by brushing. Table I gives the protgram of welding and various other data.

In making all of the Milwaukee test welds, except as otherwise noted, the surface to be welded was first cleaned by light grinding and brushing. The weld metal was peened immediately after application and cleaned with a wire brush. Beads were placed alternately on the point and wing to permit cooling of the base metal. The same welder made all of the welds.

Periodic inspection of the castings has been made since installation and measurements have been taken to determine the rate of wear and batter. Photographs of all the 24 castings were taken September 15, 1944, together with a final set of profile readings, and a general inspection was made at that time.

Table 1
General Welding Data and Conditions on Milwaukee

Frog No.	Welding Rod	Coating	Size	Grip	Rods Used	Brinell Hardness Before	Brinell Hardness After	Current Nominal	Current Oscillograph Short	Current Oscillograph Arc	Time ½ Rod Seconds	Remarks and Special Conditions
						Center Panel						
1	S.S.	Coated	5/32x18	M	20	453	240	115	225	95	70	
2	S.S.	Coated	5/32x18	M	6	......	......	......	......	......	......	Stainless bond
	N.M.G.	Coated	3/16x14	E	17	453	240	135	265	110	97	covered with NM
3	N.M.	Bare	1/8 x18	M	34	429	240	90	170	75	70	
4	N.M.	Bare	3/16x18	M	24	406	290	125	250	95	95	No peening
5	C.M.M.	Bare	3/16x18	M	21	432	273	130	240	95	61	
6	N.M.	Bare	3/16x18	M	21	444	240	100	220	75	60	
7	N.M.	Bare	3/16x18	M	21½	382	273	130	225	95	65	
8	N.M.	Bare	3/16x18	M	19	429	257	160	260	125	45	
						West Panel						
1	N.M.	Bare	1/4 x18	M	14	386	238	165	340	125	84	
2	C.M.M.	Bare	3/16x18	M	27	474	252	135	265	95	56	Cut by torch. Point not ground. Wing Ground
3	N.M.	Bare	3/16x18	M	17	......	287	110	235	100	63	Nickel-Mang. casting
4	N.M.	Bare	3/16x18	M	20½	420	299	115	250	100	59	Nickel-Mang. casting
5	C.M.M.	Coated	3/16x18	E	19	394	252	115	250	110	124*	
6	N.M.B.	Coated	3/16x18	E	10½	432	267	115	225	145	130*	
7	N.M.	Bare	3/16x18	M	25	406	240	115	265	95	60	Ground down ¼ in.
8	N.M.G.	Coated	3/16x14	E	19	491	299	115	250	140	95*	

Legend:
S.S. -Stainless Steel
N.M. -Nickel Manganese
C.M.M.-Copper, Molybdenum, Manganese
M-Middle Grip E-End Grip
N.M.G.-Nickel Manganese, Gray Coated
N.M.B.-Nickel Manganese, Black Coated
*Time for whole rod. Rod held at end

Note.—Current values from "Oscillograph" designated "Short" are peak values for the current when a molten drop falls and shorts the arc. Current values designated "Arc" are average values for the current between peaks when it is more stable. Current values designated "Nominal" refer to nominal marking for the current adjustment lever on the welding machine. The time shown for burning ½ rod will not be one-half of the net burning time for a full rod because the rods were not held exactly at the mid length.

Toledo Terminal Tests

The condition of the Toledo Terminal frogs was such that they were welded in November, 1943. The welding program was arranged to determine the effect of peening, pregrinding and the amount of welding current. Accordingly, it was decided that five of the frogs should be built up, using a bare nickel-manganese rod, with variations of welding procedure; five with a bare copper-molybdenum-manganese rod, using the same variations of welding procedure; and the eleventh frog should be built up with coated copper-molybdenum-manganese rod. In general, the welding currents for these tests were higher than for the field tests on the Milwaukee Road. All welds were made with a 3/16-in. diameter rod. Inasmuch as seven of the frogs have trailing points and four have facing points, the welding schedule was arranged to take this into account. The data derived from these tests are shown in Table 2.

In September, 1944, an inspection was made of the frogs, photographs were taken, and contours were drawn across the top of each frog at four locations. Contours were taken 9 in. ahead of and ½ in., 6 in., and 14 in. back of the frog point. The greatest wear occurs on the point and on the

A Casting In the Center Panel of the Milwaukee Test About Two Years After It Had Been Welded

wing rail carrying the main-line traffic. Most of the wear shown by the contours is at the ½-in. and 6-in. sections. Accordingly, these sections were considered of most significance, and the loss of area compared to the original design section was measured by a planimeter for the contours obtained in the three sets of measurements. The loss of area was found to be greatest on the wing rail where the outer part of the wheel tread strikes the wing riser. The loss in area of cross section at that place before welding in some cases was more than 0.30 sq. in., with a total loss of more than a square inch for

Table 2
Welding Data on Toledo Terminal Tests

Location of Frog	Facing or Trailing Point	Type of Welding Rod	No. Used	Total Welding Time*	Net Burning Time For One Rod†	Welding Current "Arc"	Test Conditions: Current	Test Conditions: Peening	Test Conditions: Pregrinding
Ohio Public Service	Trailing	CMM (bare)	37	60 min.	74 sec.	150	High	Yes	Surface Cleaned
Starr X-over	Trailing	CMM (bare)	29	66 min.	110 sec.	90	Low	Yes	Surface Cleaned
Hickson-Peterson	Trailing	CMM (bare)	26	63 min.	84 sec.	125	Intermediate	Yes	Surface Cleaned
Consaul X-over	Facing	CMM (bare)	43	75 min.	74 sec.	150	High	Yes	¼ in. Deep
Consaul Storage	Facing	CMM (bare)	23	39 min.	75 sec.	150	High	No	Surface Cleaned
Cothrel Coal	Trailing	NM (bare)	27½	55 min.	75 sec.	150	High	Yes	Surface Cleaned
Sun Oil	Trailing	NM (bare)	25	65 min.	110 sec.	90	Low	Yes	Surface Cleaned
Woodville Team	Trailing	NM (bare)	25	70 min.	85 sec.	125	Intermediate	Yes	Surface Cleaned
Woodville X-over	Facing	NM (bare)	34	62 min.	72 sec.	150	High	Yes	¼ in. Deep
Harbauer	Facing	NM (bare)	24	39 min.	76 sec.	150	High	No	Surface Cleaned
Wickers X-over	Trailing	CMM (coated)	32	74 min.	93 sec.	150‡	High	Yes	Surface Cleaned

Notes: Welding rod 3/16 dia. by 18 in. length
CMM = copper-molybdenum-manganese; NM = nickel-manganese
*Excluding delays to clear train, etc.
†Average for five rods
‡Coated Rod has different relation between current and burning time

the whole cross section in some cases.

The results so far as wear is concerned do not seem to be consistent with respect to any of the welding features. The welds with a 150-amp. welding current have some of the larger total losses in area but, on the other hand, three welds with the same current had values in the lower range of values. Incidentally, two of these latter three were not peened and one was preground ¼ in. deep. Three types of rod were represented in the comparisons, with no distinctive differences seen in the wear.

Hardness readings were taken April 13, 1944, with a King portable Brinell hardness tester. There seems to be no correlation between the hardness values and the amount of the wear.

Seven different types of welding rods were used in these tests, all 3/16-in. in diameter. The composi-

One of the Frogs In the Toledo Test Before Welding

tions in percentage are shown in Table 3.

Rods B, C, and H are of the nickel-manganese type. Rods D and E are of the copper-molybdenum-manganese type. Rod F was an austenitic type armor-plate welding rod. Rod G was an unalloyed low carbon welding rod, the alloy being provided in a very thick coating. Studies were made of test welds using these rods on special bar castings of heat-treated manganese steel such as is used in special trackwork and also of test welds on full-size frogs which had been removed from track and scrapped.

To study the effect of welding on work-hardened surfaces, two series of test welds were made and the weld structure examined in the laboratory. One series included the welds made on the small test bars. Prior to welding, the bars used were work-hardened under a Bradley hammer. The other series of welds was made on cold-worked scrap frogs not ground or ground to a depth of ⅛-in.

Micrograph studies of a flame-cut edge showed that the austenitic structure of the manganese was affected by the heat from the cutting torch to a depth of approximately 0.04 in. To study this further, a similar micrograph was made of an arc-cut surface. In addition, welds were made on arc and flame-cut surfaces of test bars, without grinding and with various amounts of grinding and on flame-cut scrap frogs without grinding.

Table 3
Composition of Welding Rods
(Figures Are Percentages)

	B	*C*	*D*	*E*	*F*	*G*	*H*
Carbon	0.70-0.96	0.75-0.90	0.88	0.81	.07-17	0.10	0.75
Manganese	13-15	13.0	12.98	13.47	3.30- 3.75	0.49	12.60
Phosphorous	0.05 Max.	0.05 Max.	0.038	0.034	....	0.018	0.059
Sulfur	0.07 Max.	0.05 Max.	0.007	0.009	....	0.026	0.006
Silicon	0.90-1.20	....	0.64	0.40	0.80 Max.	0.04	1.55
Nickel	3.4-4.0	3.0	Nil	Nil	9.0-9.7	Nil	2.62
Molybdenum	....	....	0.46	0.05	1.10 Max.	Nil	0.05
Copper	....	....	1.32	0.30	18.0-20.5	0.02	0.19
Chromium Coated	No	Yes	No	Yes	No	Yes	No

The report of the laboratory investigation contains numerous micrographs of the experimental welds. In intrepreting the results, it was assumed that welds showing the least cracking, porosity and carbide precipitation of the base metal, and a fine grain structure, will give the most satisfactory service in track.

The laboratory study showed that four important factors are involved in obtaining satisfactory welds on high manganese steel, as follows:

(a) A sound and uncracked base metal upon which the deposit is laid.

(b) A minimum heat effect upon the base metal, to prevent cracking and carbide precipitation at the grain boundaries.

(c) A weld junction with a minimum of carbide precipitation, to prevent a zone of weakness or brittleness.

(d) A weld deposit free from cracks inclusions with good grain structure and satisfactory hardness.

General Conclusions

From both the laboratory and field tests, certain tentative conclusions and comments appear to be justified or indicated, while the effect of some factors was indeterminate. These conclusions are as follows:

(a) It has been found very important to remove by grinding any cracks or defective metal before welding.

(b) The most desirable welding current for a 3/16-in. diameter bare rod is, quite evidently, greater than 100 amp. A current of 125 amp. gave good results with the nickel-manganese rod and 150 amp. with the copper-molybdenum-manganese rod.

(c) The effect of the composition of the welding rod was not clearly indicated in the field tests, although in the Toledo Terminal tests the performance of the copper-molybdenum-manganese was somewhat superior to that of the nickel-manganese rod. Metallurgical examination of the laboratory test specimens showed greater freedom from cracks and better weld structure with the copper-molybdenum-manganese rod.

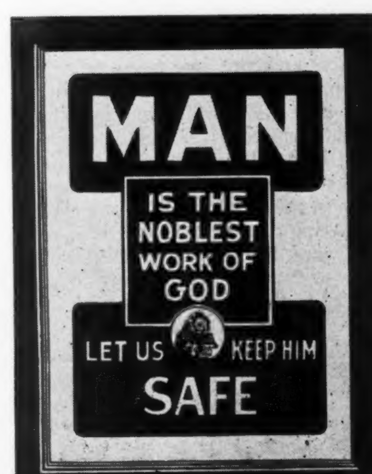
(d) Removal of the work-hardened surface by deep grinding before welding did not give noticeable benefit.

(e) The results from the coated rods were indeterminate. Some tests showed good results and others did not.

(f) Good or fair welds were obtained in the field tests in some cases without peening. The laboratory tests show definite benefits from peening in hardening the deposit and in minimizing cracks in the weld deposit.

(g) The weld applied on a flame-cut surface without grinding in the Milwaukee field test gave good performance. The laboratory study indicated that this practice was detrimental to the metal structure. Welding on a flame-cut surface without removing the heat-affected metal to a depth of ⅛ in., or more, by grinding, is not recommended, pending the development of additional data.

(h) Many of the castings in the Milyaukee field test that gave the best performance were welded at temperatures at, or considerably below, freezing. This indicates that good welds can be obtained in cold weather.



This Poster, No. 263, Constitutes the August Installment of "All the Year—Every Year Safety Program" of the Safety Section, Association of American Railroads

Two Train Accidents Laid to Track Conditions

THE Interstate Commerce Commission has recently issued reports on two accidents involving train derailments, each of which was caused by a track condition that was ascribed to improper attention by the maintenance forces. One of these was a passenger-train accident on the Atlantic Coast Line, in which 43 persons were injured, and the other was the derailment of a freight train on the Chicago, Rock Island & Pacific, which resulted in the death of an employee. The following information regarding the two accidents is abstracted from the I.C.C. reports.

On the A. C. L.

The accident on the Atlantic Coast Line occurred when members of a section gang engaged in renewing ties failed to follow instructions governing the number of track spikes that are permitted to be pulled at any one time. It took place on May 31, 1945, about 3:03 p.m., near Kissimmee, Fla., on a tangent section of main-line track where the maximum permissible speed for passenger trains is 60 m.p.h. The scene of the accident was in single-track territory, extending southward from Sanford, Fla., to Port Tampa, Fla., in which territory trains are operated by timetable and train order.

No. 91, the train derailed, a southbound first-class passenger train consisting of 3 Diesel-electric units and 13 passenger train cars, passed Pine Castle, Fla., 13.4 miles north of Kissimmee, and the last open office, at 2:51 p.m., 2 hr. and 9 min. late, and a short time later, while running at an estimated speed of 57 m.p.h., was derailed 1.22 miles north of Kissimmee, the three Diesel units, the first seven cars and the front truck of the eighth car leaving the track. Forty-three persons were injured and the derailed equipment was severely damaged.

Prior to the time of the accident the engine and cars were riding smoothly and there was no indication of defective equipment or track. The enginemen, maintaining a lookout ahead, saw members of a track force as the train approached the scene of the accident, but did not see or hear any warning signals. When the engine passed over the point where the derailment occurred the enginemen felt an unusual movement of the first unit of the engine. Then he observed that 75 or 80 ft. of the east rail immediately in front of the engine was deflected eastward from 4 to 6 in., and immediately moved the brake valve to emergency position. After the accident, it was found that repairs to the track had been in progress, and that the spikes had been removed from 49 ties located at various points between the point of derailment and a point 350 ft. to the north.

The track structure in the vicinity of the accident consisted of 100-lb. rail, 39 ft. long, laid in 1928 on an average of 22 ties to the rail length. The rail was fully tie-plated and single-spiked, and was ballasted with crushed rock. No rail anchors were used and the track gage was found to vary between 4 ft. 8⅛ in. and 4 ft. 8½ in.

Working on Track

On the day of the accident a section foreman and seven men were engaged in replacing defective ties and in raising and resurfacing the track in the vicinity where the accident occurred. According to the roadmaster the instructions given to section foremen for replacing ties provide that spikes should not be removed from more than one tie at a time while performing work such as was being done on the day of the accident. The investigation disclosed, however, that it was the practice of the section foreman involved to remove spikes from two adjacent ties at a time, and that, in this instance, one of the laborers had removed an unusual number of spikes without his knowledge.

During the day that the accident occurred the highest temperature at Kissimmee was 101 deg. The loosened rails were on a descending grade of 0.55 per cent and the point of derailment was 577 ft. north of the north end of 400 ft. of level track, which was followed by an 0.34 per cent ascending grade. Evidently the high temperature, the loosened condition of the rails and the lack of rail anchors resulted in the rails creeping southward on the descending grade until they met resistance on the ascending grade. When the rail could not move further southward, the loosened east rail shifted outward sufficiently for the left wheels of the first Diesel unit to drop inside that rail.

The commission found that this accident was caused by the insecure condition of the track.

Rock Island Derailment

The accident on the Chicago, Rock Island & Pacific involved the derailment of a freight train near Saginaw, Tex., when it was passing over an improperly maintained turnout when entering a siding. The accident which took place on April 3, 1945, about 2:01 p.m., occurred at the frog of a No. 10 turnout from a single-track main line with a tangent alinement. The section of main track involved is the line extending southward from Waurika, Okla., to Ft. Worth, Tex., over which trains are operated by time table and train orders.

Extra 2688, a southbound freight train, consisting of engine No. 2688, 53 cars and a caboose, passed Newark, Tex., 13 miles north of Saginaw, and the last open office, at 12:54 p.m., and a short time later, while moving at an estimated speed of 10 m.p.h., was derailed as it was entering the north switch of the siding at Saginaw, which is located on the east side of the main track. The engine and first five cars left the track. The head-end brakeman was killed and the derailed equipment was severely damaged.

About 1:59 p.m. on the afternoon of the accident, the head-end brakemen of No. 96, a northbound freight train, lined the north switch of the siding at Saginaw to permit southward Extra 2688 to enter the siding. About two minutes later, as Extra 2688 was moving through the turnout, with the engine at a point about 75 ft. south of the switch, the engineer observed an unusual movement of the engine and immediately moved the brake valve to emergency position. The engine stopped practically upright and in line with the siding, with the right wheels outside the west rail and the left wheels inside the east rail.

The track structure through the turnout involved in the accident embodies 112-lb. rail, which was laid new in February, 1945. The rail is fully tie-plated with canted double-shoulder tie plates, is single-spiked, and is provided with rail anchors. The frog is of the 112-lb. spring-rail type and is 17 ft. 10½ in. long, with a 2-in. flangeway for either of its positions. A guard rail 9 ft. long is located inside the east rail of the turnout, and its center is opposite the point of frog. The ends of the guard rail are flared, and end blocks bolted to the web of the guard rail are provided. The side of the base of the guard rail is so designed that it fits under the edge of the base of the running rail. The guard rail extends across six ties, and

three tie plates, each designed so that it supports both the running rail and the guard rail, are so arranged that each one lies on two ties.

Examination of the track disclosed that the frog point was battered to the right about 1/8 in., and that there was a flange mark on the tops of the frog and the lead rail. It was also found that the track gage varied between 4 ft. 8 3/16 in. and 4 ft. 8 11/16 in. throughout a distance of 77 ft. immediately north of the frog, and that the gage at the point of frog was 4 ft. 8 3/16 in. Also, the top of the left rail was found to vary from 3/4 in. lower than the top of the right rail in the first 40 ft. of the turnout to 1 1/2 in. higher at the point of frog. The tie plates under the guard rail were single-spiked on each side, with a guard-rail holding spike inside the guard rail and a rail holding spike outside the running rail. The spikes outside the running rail were not fully driven and the heads were about 3/4 in. above the base of rail. In the investigation that followed the accident the roadmaster said that when the new rail and switches were laid at Saginaw in February the guard-rail tie plates were not fully spiked because the switch ties had not yet been spaced.

The manner in which the accident occurred was explained by the I.C.C. report as follows:

"The normal action of an engine moving on a curve to the left having no super-elevation is for it to incline to the right. In the present case, the right running rail in the vicinity of of the point of frog was 1 1/2 in. lower than the left rail, and this condition caused the flange of the right engine-truck wheel to bear heavily against the right rail and the point of frog. However, throughout the first 40 ft. of the turnout the left rail was from 1/4 to 3/4 in. lower than the right rail. These irregularities in cross level would cause the engine to roll laterally. Since the gage of the track at the point of frog was 5/16 in. less than standard, the flanges of the engine-truck wheels were compressed against the gage sides of the rails. This condition combined with irregularities in cross level required a properly secured guard rail opposite the frog to prevent the right engine-truck wheel from either mounting the frog point or passing to the right of it. However, the investigation disclosed that the guard rail was not sufficiently secured, and it canted inward enough from pressure exerted against it by the back of the left engine-truck wheel to permit the other engine-truck wheel to mount the frog point."

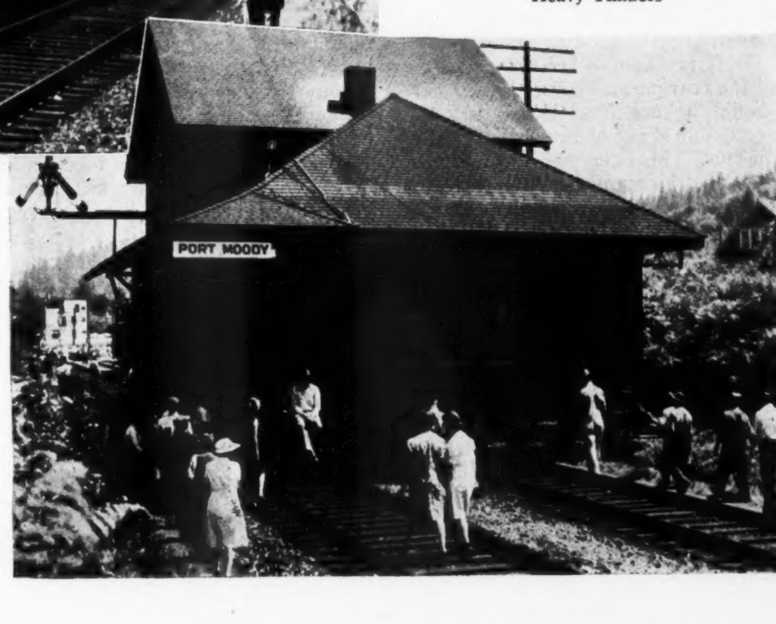
The conclusion reached was that this accident was caused by an improperly maintained turnout.

Station Moved Half Mile—Fast

CITIZENS of Port Moody, B. C., recently witnessed an unusual sight, when their station building was skidded down the main line tracks of the Canadian Pacific to a new site, one-half mile nearer the center of town. Need for speed complicated what otherwise would have been a simple job, since the work required the blocking of both eastbound and westbound main line tracks temporarily, but the change was completed in seven hours (several hours less than the time that had been allowed), with telegraph and telephone lines connected.

The building was moved by jacking it up and putting a cribwork of heavy timbers beneath it; after which it was rolled laterally on to timbers straddling the two main line tracks. This procedure was reversed at the new site, where the station was placed on a new concrete foundation.

The rails were greased and a steam winch was used to start the building moving, after which a yard engine pulled it along at two miles an hour, with scores of Port Moody citizens walking behind. To make the shift in location, not a single piece of furniture was removed from the building. The station clock never missed a beat and was right on time when the agent stepped into his office.



Left—The 75-ton Two-Story Frame Structure Was Moved Along Over the Rails By a Yard Engine. Below—This View of the Station Building, Taken While It Was Being Moved, Indicates the Manner in Which It Was Supported on the Rails by Heavy Timbers

What's the ANSWER?

When Changing Type of Ballast

When changing the type of ballast, is it better to skeletonize the track or to bury the old ballast and place only enough new ballast under the ties to bring the track to the desired gradient? Why? What considerations are involved?

Get Rid of Old Ballast

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

I consider this an exceptionally timely question, for heavier wheel loads, higher speeds and increased traffic are combining to require that only the best materials and workmanship be allowed to go into the track. If a road desires to obtain the best results from its expenditure for new ballast, the logical thing is to cut out all of the old ballast, cast it on the shoulder of the roadbed to strengthen weak places; then, while the track is skeletonized, the ties should be spaced, old ties renewed and the track gaged. As rapidly as this can be completed, enough new ballast should be unloaded to bring the track to elevation.

It is my firm belief that, in view of the current loads and speeds, there should be not less than 6 in., and preferably 8 in., of new ballast under the ties. This is enough to give satisfactory drainage for at least three or four years, and perhaps longer, depending on the volume and character of the traffic carried by the line, as well as on local conditions. Ballast renewal today is much reduced in volume compared with 15 and more years ago, when traffic was small, considering the tonnage that is being handled today. For this reason more ballast is foul and "dead" than has been the case for many years, and drainage is much less effective than it should be. Such ballast is completely unsatisfactory for any purpose other than for strengthening the shoulder of the roadbed. It should, therefore, be dug out and spread on the shoulder of embankments, and should be replaced with clean new ballast.

By All Means, Skeletonize

By H. M. Tremaine
District Engineer, Northern Pacific, Spokane, Wash.

It is obvious that the primary purpose of application of new ballast is better to fit the track for its job of supporting adequately the loads that are superimposed upon it with the least injury to its structure. All ballasted tracks are not designed for the same task, but that task may be regarded as relatively constant, after weighing the factors involved. One of the most cogent reasons for inserting new ballast is to recreate the conditions that insure good drainage.

Were one merely to raise the track on the old ballast, the drainage requirements would not be met. It is permissible to raise the track on old material only where the lift is so great as to afford ample depth of new ballast under the ties. In tracks having reasonably heavy requirements, this depth should be not less than 12 in. In view of the wheel loads, the tonnage and the speed requirements that exist today, and considering what may be required tomorrow, a ballasted track must be one that can be maintained with the minimum of disturbance and of mechanical destruction of the ties and rail. Without drainage, water pockets are formed under the ties, with the inevitable result that a major operation to cure the defect will be required eventually. By all means, the tracks should be skeleton-

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in October

1. *Should anti-splitting irons be applied to all ties? Why? If not, to what ties? When should they be applied? Why? How many? What type of iron is most satisfactory? Who should apply them?*

2. *Who should be held responsible for maintaining sound safety practices among the bridge and building forces? Why? What measures have been found particularly effective?*

3. *What can be done to improve track maintenance during dry weather on embankments built of gumbo? In wet weather?*

4. *What methods should be employed to prevent the over-driving of piles through hard soil, but not to rock, when deep penetration is required? Does this differ for wood, concrete and steel piles? How? Why?*

5. *Is it desirable to employ markers to indicate the degree of curvature? What are the advantages? The disadvantages? What form of marker? Where should it be placed?*

6. *To what extent can the incrustation of pipe lines be prevented or reduced in lime-soda ash treating plants? What is the effect on the treated water? On locomotive boilers?*

7. *What are the causes of sun kinks? How do they develop? What can be done to prevent them?*

8. *What precautions, if any, should be taken when painting the exterior of buildings in hot weather? Why?*

ized when new ballast is to be applied, and the material should be used to widen the embankment shoulders, or wasted if not needed for this purpose.

Always Skeletonize Track

By H. F. Fifield
Engineer Maintenance of Way, Boston & Maine, Boston, Mass.

We have always made it a practice to skeletonize the track and level off the roadbed ahead of an application of stone ballast. Generally, where the stone ballast is being applied, the old ballast is in poor shape and, unless the track is skeletonized, each old tie bed is left under the new ballast, thus forming a water pocket.

In some cases we have skeletonized track where new gravel has replaced old gravel and, as a matter of fact, in some places where this has not been done, the new gravel has become muddy in a very few years because of the presence of water in the pockets left in the old ballast. I believe that the correct way to install new ballast is to provide a smooth foundation for this ballast.

Leaks in Pipe Lines

To what extent is it desirable to search for leaks in pipe lines? Should this be done only on obvious evidence of leaks? How can it best be done?

Leaks Represent Loss

By C. E. Russell
Supervisor Water Service, Illinois Central, Chicago

The function of a pipe line is to deliver air, gas, steam or liquids in sufficient volume and at a pressure that will assure their use for the purpose desired. Obviously, leaks reduce or interrupt the fulfillment of this function and not only create hazards but cause real losses. Many yards, shops and buildings of various types are built on areas of filled ground making for unstable support for sewers and underground pipe lines. Where pipe lines and sewers are laid in close proximity, there is a possibility that leaks will occur in the pipe lines by reason of settlement, whereby joints are loosened or pipes are cracked. In some cases water may escape into the sewer without any surface indications of leaks; in others, enough of the soil may be eroded to endanger walks, roadways, tracks and even building foundations.

It becomes essential, therefore, that a constant lookout for leaks be maintained and that they be repaired quickly when found, to avoid waste of the water and unnecessary repairs to tracks or structures. Inflammable gases and liquids are sometimes sources of grave danger of fire or explosion. For this reason, careful inspection should be made at frequent intervals of the pipe lines carrying these materials.

If found in time, ordinary leaks can be repaired with no interruption of normal service; if not detected or if neglected, it might become necessary to discontinue use of the pipe line until repairs can be made. Normally, leaks in underground pressure lines show up on the surface of the ground, and in most instances make their detection a minor problem. Prompt reports of such leaks are usually made by those working in the vicinity. Small leaks, except in lines carrying inflammable liquids or gases, may not be important, and in some cases it may cost more to detect and repair them than to ignore them. If, however, a large leak or a series of small leaks should become apparent through an unexplainable increase in consumption, a thorough survey should be made of all pipe lines after all fixtures and exposed piping, including relief valves and overflow lines, have been examined.

There are several methods of determining whether underground leaks are present; one that requires no special equipment being to examine all sewers in the vicinity of the pipe lines to determine whether there is an increased flow in any given section. Pumping a harmless dye into the pipe line will aid when making such an examination. There are also instruments available for detecting leaks which amplify the sound of the leak when brought into contact with the pipe line. A slow but effective method of detection is to shut off all outlets, sectionalize the pipe and insert a meter. In any investigation to locate leaks, reliable results are possible only when the testing crew is skilled in the use of the equipment and has a thorough knowledge of the location and size of the pipe lines that are under test.

May I add that if all of the energy and a small part of the cost involved in leak detection could be used to educate those concerned with the installation and use of pipe lines and fittings in the theory and practice of leak avoidance rather than leak detection, this would be a happy world for the water-service repairman.

Leaks Are Inherent

By Engineer of Water Service

That leaks in pipe lines are inherent is recognized by the fact that most specifications for the construction of such lines permit a limited amount of leakage per hundred feet of the line, and it is only by constant vigilance that the leakage can be kept within the limit generally specified. Unfortunately, thereafter, little attention is given to the possibility of leakage until its presence is indicated on the surface of the ground, and even then, it is often neglected until it becomes a nuisance.

If the many thousands of miles of underground pipe lines in railway service were exposed, much of the complacency with which these unseen leaks are accepted would be dispelled. It is impossible to estimate even roughly the amount of water wasted annually by reason of leakage in pipe lines, but it is not debatable that the loss is enormous. This is apparent at once if we assume that leakage averages only one gallon per mile of pipe line per minute, a figure that is almost ridiculously low. On this basis, the annual cost of the water wasted amounts to more than $1,000,000.

Any appreciable loss through leaks is usually indicated by increased demand, loss of pressure or the appearance of water at the surface of the ground. Minor leaks may find their way to a nearby drain or the water may seep away. While their effect on demand or pressure is too small to attract attention, in the aggregate it is large.

Leaks may be suspected following water hammer or a marked increase in pressure through valve closure or other cause; through faulty pump operation that causes excessive shock; as a result of ground settlement; also as a result of vibration where pipe lines are laid alongside or across tracks; through the abandonment of service lines without plugging the connection at the main.

Several devices are available for detecting leaks, all of which depend on listening for the noise of the escaping water. The simplest of these consists of an ear phone, attached to a small rod. If a leak is suspected, the rod is applied to the pipe, to a hydrant, a valve or a connection. Any sound in

the pipe line is amplified so that the noise made by the leak can be identified. Where the pipe is not exposed and there are no fittings near, the rod can be driven down to the pipe. Other devices, on the principle of the stethescope, are also available. Auxiliary meters are sometimes employed in conjunction with the master or permanent meter, any loss through leakage being indicated read by discrepancies in the meter readings. A complete survey of individual pipe installations at regular intervals is advisable, particularly at large terminals and yards. They usually result in a substantial return in the amount of water saved.

Minimum Depth for Reinforcing

What minimum depth below the surface of concrete should be required for reinforcing? Why? Does the character of the structure or the location of the member make any difference?

Determined by Exposure

By J. P. Dunnagan
Engineer of Bridges, Southern Pacific, San Francisco, Cal.

The depth of the cover for reinforcing steel is determined by the exposure to be expected and by the ability to make necessary repairs in the event of spalling. On the relocated line around the Shasta Dam, the following distances were required for the outer surfaces of the concrete:

1. Piers, some of which were entirely submerged in the lake, 7 in. below the surfaces, bars up to 2 in. square being used.
2. Smaller structures, rigid frames, culverts and wing galls, 2 in. of cover.
3. Tunnels, where gases from locomotives may deteriorate the concrete, 3 in. of cover.

I consider this amount of protection ample for concrete that is designed and placed correctly.

Concrete subject to flexure, such as beams and slabs, should have the steel placed with the minimum of cover, to prevent the cover from spalling.

In any use of concrete, if the concrete itself is not designed and placed scientifically, no amount of cover will be sufficient to protect the steel.

Must Avoid Rusting

By A. B. Chapman
Bridge Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

To determine the thickness of the cover for reinforcing steel in a concrete structure, one must take into consideration the type of the structure, the location of the unit in question and the conditions of exposure.

In buildings where the member is not exposed to the elements, the covering should be only enough to cover the bar completely, to hold it in place, to develop bond and to provide protection from fire. The cover recommended for columns, beams and girders should be 1 to 2 in. to protect the reinforcing against a fire of one to four hours duration. For solid slabs, the thickness may be reduced to ¾ to 1 in. The cover of the top and sides of a reinforced member subject to weathering should be at least 2 in. to protect the bars from rusting.

Bridge piers and abutments, and the floors and side walls of culverts that are subject to wearing action from ice, sand and gravel or other stream-laden debris should have enough cover so that it can act as a wearing surface, and yet insure protection for the steel. Roadway slabs subject to wear from vehicular traffic should have an extra cover over that ordinarily required, of sufficient depth to protect the steel. This added thickness for each of the foregoing cases should be governed by the expected wear.

Where a unit of a structure is placed on the ground, the reinforcing steel should be placed with a bottom cover of 3 to 5 in. If the support is even and firm, the covering may be less than where it is irregular, wet or soft.

Reducing Motor Car Accidents

What precautions should be observed in the operation of motor cars to reduce the probability of accidents? Who should be responsible?

Most Are Collisions

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

About 75 out of every 100 motor-car accidents are collisions with trains or locomotives. The remaining 25 have miscellaneous causes, such as being run into at highway crossings; hitting other motor cars; striking obstructions on the track; tools falling from the motor car; a trailer becoming detached or derailed; an interlocked switch thrown under or immediately ahead of the car; running at high speed; and a variety of other causes. All of these latter are, with few exceptions, preventable if care is exercised by the motor-car operator. Observance of the rules covering the operation of motor cars, or even the exercise of common sense, will avoid all such accidents, excepting under unusual conditions, such as reptiles or animals getting onto the rails immediately in front of the motor car so suddenly that the operator has no opportunity to act.

Collisions with trains can be avoided by rigid observance of instructions and information issued for the guidance of those operating motor cars. Both should be issued in writing and should be signed and acknowledged the same as a train order, because human lives are involved. When or where it is not possible for motor-car operators to obtain the instructions or information covering the movements of their cars, the safe course must be taken, with full front and rear flag protection. In no circumstances should chances be taken with respect to either the car or its occupants.

Must Exercise Care

By W. H. Sparks
General Inspector Track, Chesapeake & Ohio, Russell, Ky.

No precaution in the operation of a motor car is so small or so unimportant that it can be overlooked with impunity. From the moment that the line-up is received and the car is inspected and placed on the tracks, responsibility rests upon both the foreman and the operator to see that all rules and special instructions are obeyed to the letter. Under some conditions, strict adherence to the rules may seem unnecessary and needlessly burdensome, yet many a man might still be alive if he had obeyed them

strictly, even though he considered it unnecessary to do so.

If, for any reason, the foreman cannot get in touch with the dispatcher when the car is ready to be moved, it becomes his responsibility to see that the car is protected fully by flag, both day and night, for a car loaded with men or materials or both may be as much of a menace to trains as they are to the car, so that the lives of both trainmen and trackmen may be equally in danger if the operation of the car is not protected fully.

Even with close co-operation between the dispatcher and the man in charge of the car, accidents occur because someone overlooks a rule or ignores an instruction, or errs in calculating the time interval until a train is to arrive. Taking into account the train speeds of today, the consequences of such laxity may be most serious.

Must Be Qualified

By L. J. Benson
Assistant to Chief Operating Officer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Precautions to guard against track-motor-car accidents require that, first of all, the car be placed in the hands of a qualified employee, and that it be inspected thoroughly to make sure that it is in good working order. Tools should be stowed on the car in a safe manner and there should be adequate flagging equipment, preferably in a container designed for that purpose.

Before starting, a line-up of trains should be obtained, which should be read and checked carefully by all of the employees on the car to insure a complete understanding. After starting, the brakes should be tested to insure that they are in safe operating condition.

It is also important to give consideration to such conditions as slippery rails, and to fogs or other obstructions to a clear view, especially when approaching a grade crossing. There may be curves on the highway near where it crosses the railway, in which case a specially sharp look-out should be maintained. Where necessary, the track motor car should be stopped before it proceeds over the grade crossing to make sure that no vehicular traffic is approaching that might cause a mishap; highway traffic should always be given preference.

Speed requirements should be observed rigorously, since excessive speed has entered into many motor-car accidents. Motor cars are built to run faster than the rules allow. Sometimes this can be useful, but the operator should never take advantage of this fact.

These are a few of the fundamental precautions a motor-car operator should observe, and most roads have them covered adequately by their safety rules. Motor-car operators should be thoroughly familiar with these safety requirements and should follow them rigidly while on the job.

As to responsibility, this rests fundamentally with the operator, with this qualification—dispatchers have a responsibility to provide adequate information when called upon to supply the operator of the motor car with a line-up of trains.

What Paint on Steel Bridges?

Can white lead be used as the finishing coat for bridges and other steel structures? If not, why? If so, what are the advantages? The disadvantages?

All Steel Rusts

By George Voss
National Lead Company, Chicago

All structural steel bridges, from the smallest span to the largest and most imposing structures, regardless of differences in design or the character of the traffic they must handle, have one thing in common, that is, they rust and deteriorate unless they are kept protected with paint.

Taken as a class, bridges put paint to a severer test than any other type of structure. Most of them are located over water, where they are subject to high moisture exposure in the form of fog and mist. In addition, many of them are also exposed to smoke and gases from the stacks of boats passing beneath them. Furthermore, railway bridges suffer from severe exposure to concentrated smoke and sulphurous gases, particularly highway and street bridges that pass over railway tracks.

This more-than-average severity in the conditions that are generally deleterious to paint, adds importance to the selection of the protecting medium. Adoption of the best painting practice known should be the rule when it comes to applying paint for the protection of bridges. The most important part of this protection, as engineers agree, is the first or next-to-metal coat of paint. Upon its durability depends success or failure in the continual fight against rust. Only so long as the priming coat remains intact can the metal be given adequate protection in this continued fight to protect the metal from rusting.

Red lead is by far the favorite material for the priming coat for steel surfaces. Venerable structures, such as the Brooklyn bridge, as well as its more modern counterparts, of which the George Washington and the San Francisco Bay bridges are notable examples, have a coat of red-lead paint next to the metal to safeguard the millions of dollars of capital invested in them.

For all outside metal work that has not been painted previously, or from which all previous paint applications have been removed, it is recommended that the first two coats be red-lead paint. To facilitate inspection, the second coat should be tinted a light brown, through the addition of a small amount of lampblack. This should be followed by the paint necessary to produce the finish desired.

The way a bridge is to be finished depends in turn upon its location or its function. For example, railway viaducts, because of their usual location in sections where dirt discoloration is a factor, are customarily painted black or some other dark color. On the other hand, highway bridges are most frequently finished in light colors to insure greater visibility at night. White-lead paint is used quite frequently for these light-colored finish coats, because it can easily be tinted to almost any desired shade and because it is extremely durable, weather-resisting paint. It should not be overlooked that a pure-white finish is remarkably effective as a heat reflector. Recently, considerable interest has been displayed by the state of Wisconsin and by various park commissioners in the use of green as a finishing color on highway bridges, tanks and other structural surfaces.

Makes a Good Finish Coat

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

White lead makes a good finish coat for bridges and other steel structures, provided it is applied over a well-dried priming coat of red lead. Mixed with suitable thinner and drier to correspond with atmospheric conditions, white lead spreads easily and

forms a good cover for the protective coat or coats beneath. It does not dry and crack, thereby exposing the undercoats to damage which will allow moisture to reach the metal surface. Neither does it crack the undercoats with the same results to the metal.

It is true that after the thinner and drier have evaporated, the oil which forms the vehicle will dry and eventually the surface will begin to chalk, which is the natural and most desirable way for paint to deteriorate. If the vehicle is first-grade linseed oil, chalking will not begin for several years, and even after it has progressed for some time, the white-lead coat retains its protective qualities and can readily be cleaned for the application of another finish coat. When the cost of cleaning disintegrated paint from steel surfaces is considered, it becomes apparent at once that a finish coat of well-applied white lead is a paying proposition.

Thinks Well of It

By Master Painter

It is my observation that for all-around durability as a surface coating for both steel and wood surfaces, there is nothing superior to white lead. For use as the finish coat on railway steel bridges white lead has only one drawback, but under some conditions this may be a serious one. This is the ease with which it becomes discolored when exposed to locomotive smoke and gases, particularly when applied to structures over tracks, or to bridges crossing navigable streams. In general, because of this easy discoloration, the railways have avoided the use of white lead for such structures and for through bridges elsewhere. In fact, with very few exceptions, no structures extending above the track level have been finished in white.

On the other hand, I know of a number of deck steel spans upon which the railways cross streets and highways that have been finished with white lead to obtain the advantages of its reflective power. So far as my observation has gone, the finish has been quite satisfactory to both the railways and the highway authorities whenever it has been used.

One of the marked advantages of the white-lead paint is its durability, provided the vehicle is first-quality linseed oil, and also provided all of the usual precautions required for any good paint job are observed. Furthermore, the priming coat for the steel surface should be red-lead paint, and it will be of advantage to apply red lead for the second or body coat. If this is done, the paint for the body coat should have enough lampblack added so that the two coats can be distinguished readily while the painting is under way. Care should be exercised to insure that each coat is thoroughly dry before the succeeding coat is applied.

If all of these precautions are observed, the paint will last longer than it does on most bridge paint jobs. Furthermore, when repainting becomes necessary, it should be done without delay. In this event, it will seldom be necessary to do more than clean off the surface dirt and chalked material, and then apply a single coat of white lead.

What to Do With a Cracked Frog

Should a manganese-steel frog be removed from the track when a crack or partial separation occurs at the point? A rail-bound manganese-steel frog? Why? If not, what can be done to maintain the frog in service?

Several Types of Failure

By R. P. Winton
Welding Engineer, Norfolk & Western, Roanoke, Va.

Several types of failure afflict manganese-steel castings in service. Sometimes the surface of the point spalls to a depth of about ½ in., probably the result of dirty metal. This can be repaired by cleaning the cavity by grinding and then building up to the original surface by electric welding. Another failure, common in rail-bound manganese-steel frogs, is a depression on the running surface at the wide part of the point, with cracks into the flangeway. This is always caused by shrinkage cavities in the original casting, which can be repaired only by cutting out the defective metal to the bottom of the flangeway by grinding or by means of the oxy-acetylene torch, and then building up by electric welding. Such failures require considerable time to repair satisfactorily and, usually, cannot be done in the track.

Rail-bound manganese-steel frogs are subject to spalling on the wing opposite the point. If the cavity is not more than ½ in. deep, repairs can be made in the track. In many cases, however, there are shrinkage cavities in the wing, which can be repaired only by cutting out the defective metal to the bottom of the flangeway. This type of defect cannot be repaired in the track.

Cracks develop in the flangeways and under the points of solid manganese-steel frogs. Some roads have attempted to "V" out the cracks and fill them by welding. So far, I have not seen anyone who could do this work successfully. All we have been able to do is to cut out the whole point down to the bottom of the flangeway and build in a new point. Some roads have also attempted to weld in a new point without peening, but in most cases the point has failed within a few months. I do not believe that it is possible to do this work satisfactorily in the track. We have, however, repaired a large number of such defects out of the track where we had ample time to do the work, and the frogs have stood up in service.

Try to Keep in Track

By George M. O'Rourke
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

If an electric welding machine is available, with a skilled operator and suitable electrodes, the frog can be repaired most economically under traffic. If the defect is of a nature that would endanger passing trains, the frog should be removed from the track. The same procedure should be followed for railbound manganese-steel frogs.

Depends on Many Factors

By T. F. Langan
Supervisor of Track, Central of New Jersey, Jersey City, N. J.

When a crack or partial separation at the point occurs in a manganese steel frog, the supervisor must decide on the basis of conditions whether the frog should be removed or welded in the track. The factors upon which the decisions should be based include the condition of the track, particularly the presence of poor metal. If it becomes necessary to remove considerable defective metal, it will probably be necessary to remove the frog from the track.

Again, the conditions of the wing wheel riser is a factor. If there is ample metal in the riser to carry most of the load, repairs can usually be made in the track. If, however, the

risers are so worn that the point is carrying most of the load, it may be advisable to remove the frog. If a replacement frog is not available, and the condition is critical, it will be necessary to make temporary repairs in the track regardless of all other factors. If it is impossible to get a competent welder at the moment, the frog must be replaced temporarily or permanently—in the latter case when the frog has been repaired it should be held for emergencies. The amount of traffic also influences the decision as to whether a defective frog should be removed from the track.

It has been our experience that the majority of frogs require only light repairs, which can be made in the track. There have been a few instances, however, where critical cracks or breaks have developed, which have necessitated heavy repairs that can be made more satisfactorily out of the track. It all simmers down to this—the governing factors in each case are whether repairs can be made more satisfactorily in or out of the track, and how the cost for each compares, including probable delays to traffic.

Using Obsolete Track Materials

To what extent is it practical to use obsolete and semi-obsolete track materials to avoid ordering new items of critical materials?

What Is Obsolescence?

By C. E. R. Haight
Engineer of Track, Delaware & Hudson, Albany, N. Y.

In considering this question much depends on what is considered obsolete track material. Obsolescence may result from a change in standards, or it may be caused by inadequacy of design of the item under consideration to meet current requirements in its use. In any discussion of the use of obsolete material to avoid ordering new items of critical material, it should not be overlooked that the obtaining of the maximum useful life out of any material is always sound economical practice.

Where material has become obsolete because of changes in standards, such as the adoption of a new or heavier rail section, it is entirely practicable and desirable to use the so-called obsolete material. While the use of some items of obsolete material, such as the rail itself in the example cited, does not present much of a problem, there are other problems that arise in connection with its use, such as the frogs, switches, etc., which are involved by the continued use of the obsolete rail section. Difficulties encountered in the use of this material can often be overcome by confining it to one district or other limited territory, thus overcoming the necessity for using undesirable compromise joints. This will also reduce to the minimum the amount of spare or emergency material necessary to protect the material in the track. Another example of the use of obsolete material is found in the combining of different units that are interchangeable, such as the installation of good rail, using angle bars for another rail section which has the same fishing height, where joint bars for the section of rail to be laid are not available.

If the material under consideration is obsolete because of the inadequacy of its design to meet current requirements, there will be less opportunity to put it into use. Such material can be used in tracks only where the traffic is light or infrequent, such as back tracks or sidings that are used principally for storage. Such material should be used, however, when the life that can still be obtained from it will be sufficient to justify an installation that will avoid ordering new material. Whether to use such material is a matter of judgment that must be based on a knowledge of local conditions, since it would obviously be impractical to install material that would require replacement in a short time.

Summarizing, the use of obsolete or semi-obsolete material to avoid ordering new material can be effected generally only where it is of such strength and design as will enable it to stand up under traffic requirements.

Does Not Favor

By Albert G. Reese
District Maintenance Engineer, Chicago, Burlington & Quincy, Galesburg, Ill.

Up-to-date standards covering track materials have been established and installations have been made in accordance with these standards. It is not practical to use obsolete or semi-obsolete materials to replace these standard materials when it becomes necessary to replace them. New or complete installations of obsolete materials are not recommended, because of the difficulty of obtaining replacement parts, since it has always been a general practice to dispose of obsolete materials at frequent intervals, with the result that little, if any, such repair material is ever on hand.

Use Them to the Limit

By A. Drager
Maintenance of Way Storekeeper, Central of New Jersey, Jersey City, N. J.

Rail has increased in weight constantly in an effort to keep up with or in advance of the ever-increasing wheel loads that have been and still are being imposed upon it. With the adoption of every new section, whether the change is for the purpose of increasing the weight or only to improve the design, all incidental track material becomes obsolete with the discarded rail section, including joint bars, anti-creepers, switches, frogs, crossings and sometimes the bolts.

It is primarily in connection with turnouts, special frogs and crossing frogs that the question of using obsolete materials arises. It is in this group of materials particularly that the problem assumes considerable importance. Giving the subject careful attention will pay large dividends; neglecting it will cause economic losses which cannot be seen very clearly, yet they are real. In such cases money values run to a large figure.

Materials in service in tracks are subject to many hazards; something unexpected is happening all of the time. When crossing frogs and other special frogs are involved, it may become a question of what is the best action to take in order to keep traffic moving. In all cases where there are crossing frogs or special frogs in the track, it is a matter of good judgment and should be a fixed policy to have replacement materials on hand in advance of a breakdown.

The policy with respect to obsolete or semi-obsolete materials should be to use them to the limit of their ability to give satisfactory service. They should be put into as good condition as possible immediately upon their release from primary service and held as emergency protection in the event something goes wrong with the material in the track.

We know from experience about how long materials in the track will last before it becomes necessary to replace them. Having the obsolete material available will make it possible to postpone the purchase of new materials. The expense of carrying these obsolete items generally amounts

to very little. On the other hand, the cost of carrying new materials for years for protective purposes may reach a surprisingly high figure. Wherever possible this type of planning should be on a long-range basis.

Crossing frogs and special frogs should be removed from the track far enough in advance of their failure from wear to permit them to serve as emergency protection in case a breakdown occurs. Since the value of these frogs has been reduced to a very low figure by reason of the service they have performed, the cost of this form of emergency protection is quite low.

On the other hand, if new materials are carried for the same protective purpose, they must be purchased when they are not needed, and this is obviously an economic loss. Furthermore, when these new materials are carried on hand for long periods, they may, themselves, become obsolete before they actually see service and thus create a further economic loss. In addition, there may be a considerable amount of deterioration from corrosion and other causes.

It should be an established policy to use obsolete materials, or old materials of any character, wherever possible for protective purposes, thus eliminating the expense involved in the purchase and holding of new items. There may be exceptional cases where it is not advisable to carry obsolete materials for protective purposes. In the majority of cases, however, with careful planning, this policy can be carried out, and will give maximum results in economy.

Fire-Retardant Treatment

To what extent is it desirable to give building materials fire-retardant treatment? Is this affected by the use to which the building is put? By its location? Why?

Is Good Policy

By R. B. Putnam
Advertising Manager, American Lumber & Treating Co., Chicago

Whether to use fire-retardant or flame-proof treated lumber and timber will depend on several factors that may prevail singly or together in a building design. Each of these has several aspects and some are interrelated. In engine-houses, forge and welding shops and electric power stations the source of the fire is present normally, and only constant vigilance will prevent a fire from starting. Considering all fires to be accidental, it is clear that good-housekeeping and safety measures are not enough. Wood used in such buildings should be treated to prevent flame spread from the small fires that experience shows will start occasionally.

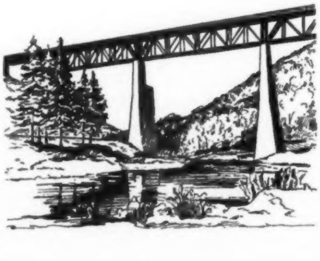
In paint shops and fuel storage areas, while the source of flame is not present normally, highly-combustible materials are, and flameproofed wood will help to confine a fire which will be violent at the beginning. Warehouses and transit sheds may contain highly flammable lading, thus putting them in the same class as buildings in which these products are processed or manufactured.

An isolated structure can be regarded solely from the standpoint of replacement cost and the fire hazard represented by its use and contents, but if the same structure were adjacent to a public building or to one that is critically important in the operation of the railroad, it assumes a different aspect. A shed for stocking drain tile hardly requires fire-retardant treatment, but the flameproofing of a tunnel lining should be accepted as a matter of course.

A pier or wharf may or may not be readily accessible to fire-fighting equipment. However, the most serious water-front fires occur under the decking where they are difficult or impossible to reach from either the land side or fire boats. Pressure treatment of both the pier decking and the superstructure with fire-retardant chemicals is being employed currently by railways, the army and the navy as insurance against disastrous fires which have occurred so frequently in these structures in the past.

When the location and contents of a building are such as to make the general use of fire-retardant treatment unnecessary, there may be parts of the structure for which flameproofing will provide economical insurance against heavy loss or damage in case of a fire. Where floor heaters are used in a small passenger station, it is obvious that a small amount of flame-proofed wood used in the framing and supports on and near the heaters will solve sensibly an otherwise expensive installation problem. Using the same approach, many other problems confronting the engineer or architect can often be solved with fire-retardant-treated wood.

In general, pressure impregnation with fire-retardant chemicals permits wood to be used where its particular advantages are desirable, yet where its flammable nature might over-rule all of its good characteristics. If the insulating value, strength and acid resistance of wood are desirable, as they are in an enginehouse roof, the disadvantage of flammability can be removed by fire-retardant treatment, without sacrificing any of the wanted characteristics. Unlike wood treated with preservatives, flameproofed wood suffers little loss of protection when cut and bored by carpenters on the job. The same is true of its paintability, since flameproofed wood can be finished with ordinary paints.



Is Entirely Feasible

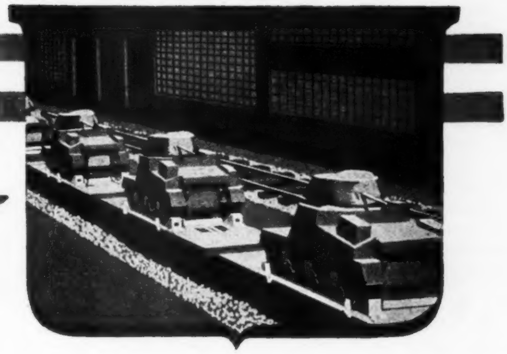
By General Inspector of Buildings

I consider it to be not only practicable to give fire-retardant treatment to building materials, but in many cases it is highly desirable to do so. When considering this subject, it should not be overlooked that some of the fire-retardant chemicals employed for these treatments are also effective as preservatives. It should also be kept in mind that flameproofed wood can be painted with the same facility and with as satisfactory results as untreated wood.

It should also be understood that fire-retardant treatments do not insure fully against destruction by fire, nor is it claimed that they do. They do, however, actually prevent fires from starting under many circumstances, and if the treatment is an effective one, they will prevent the spread of fires that start in the contents of buildings, confining them to the area of their origin until fire-fighting equipment can be brought into play.

Building lumber is too scarce and too high priced today to hazard its exposure to fire. Yet it is the most desirable material of construction under a multitude of conditions with which all of us are familiar. Anything that can be done at reasonable cost to assure long life for buildings, is a thing that should be given careful consideration.

NEWS of the Month



General Gray Receives Order of British Empire Award

Brigadier General Carl R. Gray, Jr., director general of the Military Railway Service, and former executive vice-president of the Chicago, St. Paul, Minneapolis & Omaha, and Lt. Col. Jesse M. McLellan, a former Atlantic Coast Line railroader, were recently awarded the Order of the British Empire.

Six Months' Ton-Miles

The volume of freight traffic handled by Class I roads in the first six months of 1945, measured in ton-miles of revenue freight, totaled approximately 366,337,903,000 ton-miles, compared with 368,733,822,000 ton-miles transported during the first six months of 1944, a decrease of 0.6 per cent. For the month of June, revenue ton-miles carried were 63,600,000,000, an increase of 3.1 per cent over June, 1944, and of 10 per cent over June, 1943.

O.P.A. Raises Ceiling Prices on Crossties

At the request of the Office of Defense Transportation, the Office of Price Administration has granted a 17 per cent average over-all increase in eastern producers' crosstie ceiling prices, effective July 26, according to a recent O.P.A. announcement. The increases, which range from 2½ cents to 20 cents per tie, according to species, sizes and the area in which the tie is produced, average 16 cents per tie, and are applicable to tie production in all states east of the 100th meridian, except the Dakotas. The 100th meridian passes through the Dakotas, Nebraska, Kansas, Oklahoma and Texas.

O.D.T. Acts to Provide More Cars for Armed Forces

Since June 29, the Office of Defense Transportation has issued three orders designed to make more space available to military personnel returning from assignments in the European theater of operations. The first such order, effective at midnight June 29, placed a five-day limit in advance of the departure date on the sale or allocation of space on any passenger train, in lieu of the 30-day limit previously in effect. In placing this order the O.D.T. explained that it was expected that it would result in the curtailment of vacation and pleasure travel, thus leaving more space available for military and essential business travel.

The five-day time limit order on reservations was followed on July 7 by a new directive, effective at midnight July 15, ordering that all sleeping cars operating on runs of 450 miles or less be withdrawn and placed in the general pool of sleeping cars. Since this pool is now exclusively devoted to military transport, this regulation had the effect of diverting the 895 cars released to troop movement. The third order was placed July 23, and provided that all railroad passenger coaches be considered as in a pool and subject to diversion from their regular runs to be used for military movements whenever required.

Considerable newspaper publicity concerning long troop movements in coaches preceded and accompanied the orders one such movement being from Boston, Mass., to San Francisco, Cal. Generally overlooked in these stories was the fact that the return of men from Europe in June was nearly 250,000, as contrasted with the 154,000 which the War Department had advised the railroads to expect, and an estimated 403,000 in July, compared with the 306,000 scheduled. Daily arrivals in July were as high as 35,000 men on July 20, 31,455 of whom came through the port of New York.

Truman Requests More Men for West's RRs

In a July 16 statement issued from his "temporary residence" in the suburbs of Berlin, President Truman added his appeal to those of other government agencies for additional man-power on Western railroads. A portion of the statement follows:

"If the demands of the Japanese war are to be met, the railroads in the West must have additional man-power immediately . . . The Western railroads today need 65,000 men and need them badly. We must keep men and material flowing into the ports as fast as our convoys can transport them to the battle zone."

Sughrue Honored by University of New Hampshire

At its June commencement exercises, the University of New Hampshire conferred an honorary degree of Doctor of Engineering upon Timothy G. Sughrue, chief engineer of the Boston & Maine and the Maine Central. In conferring this degree, Mr. Sughrue was cited as an "able engineer; contributor to the efficiency of the arts of transportation; participant in the development and management of an enterprise so vital to the economic health of the region in which we live; and a patriotic and ingenious contributor to the effective movement of men and supplies in this war."

Western Railroads Now Short 65,000 Men

Recent estimates of the Railroad Retirement Board, the Office of Defense Transportation, and the Western railroads indicate that the latter must recruit 65,000 additional employees immediately if the heavy burden of prompt movement of men and material to the Pacific ports is to be met successfully. Acting to meet the emergency caused by the sudden shift in the war effort to the Pacific theater of operations, certain Western railroads have been granted national man-power priorities equivalent to that previously granted only to a few "war industries."

At the same time, the Western Railroad Manpower Project has been inaugurated by the Army Service Forces to acquaint the public with the serious labor shortage existing on the Western railroads and its relationship to the successful prosecution of the war against Japan. This project has adopted the track spike as its symbol, with the slogan "Spike the Jap. Get a railroad job now. 65,000 workers needed by Western railroads."

Giving further assistance to the manpower needs of the Western lines, the War Department, on June 29, announced the granting of emergency 30-day furloughs to 4,000 soldiers with railroad experience in order to ease the critical shortage, the men furloughed to be train and enginemen and shop machanics. So far as the maintenance-of-way department is concerned, the principle outside assistance still comes from the employment of Mexican Nationals. As of July 14 there were in excess of 66,000 such workers in the United States on an allotted quota of 71,548, and a maximum ceiling of 75,000. Of these 66,000 Mexican Nationals, more than half were employed on Western railroads. A temporary source of railroad labor is also to be found in the employment of high school students during summer vacations, the number of students currently employed being estimatd at approximately 25,000, the large majority in maintenance work.

Changes in Railway Personnel

General

A. L. Kleine, division engineer of the Denver & Rio Grande Western, at Grand Junction, Colo., has been promoted to trainmaster, with headquarters at Alamosa, Colo.

W. S. Moore, acting superintendent of the Louisville division of the Louisville & Nashville, at Louisville, Ky., has been appointed superintendent.

G. H. Harris, assistant to the vice-president of the New York Central, Lines West of Buffalo, and an engineer by training and experience, has retired. **Neil D. Hyde,** assistant to the chief engineer, Lines West of Buffalo, has been promoted to assistant to the vice-president, with headquarters as before at Chicago, succeeding Mr. Harris. Mr. Hyde was born at Afton, N.Y., on November 19, 1889, and was graduated from Union College. He entered railway service in September, 1912, as a rodman on the New York Central at Utica, N.Y. In June, 1914, he resigned, subsequently becoming an engineer in the New York State engineering department. During World War I Mr. Hyde served as a lieutenant in the Engineers' Corps of the U. S. Army, returning to the New York State engineering department in 1919. In May, 1922, he re-entered the employ of the New York Central as a junior engineer on the Hudson River Connecting, subsequently serving as assistant engineer at Albany, Buffalo and Syracuse, N.Y., and at New York City. Mr. Hyde was advanced to special engineer in the office of vice-president, at Chicago, in November, 1935, and to assistant to the chief engineer, at Chicago, in November, 1943.

Neil D. Hyde

Many general officers of the Baltimore & Ohio have had their jurisdiction extended to cover the Baltimore & Ohio Chicago Terminal, a change which gives the B. & O. C. T., in effect, the status of a fifth region of the parent company, and to that extent, makes it conform with the B. & O. pattern of regional administration. Maintenance officers who have thus had their jurisdiction extended are: **A. C. Clarke,** chief engineer; and **C. B. Harveson,** chief engineer maintenance.

F. C. Kronauer, chief engineer of the New York, Susquehanna & Western, has been promoted to general manager in charge of operation and maintenance, with headquarters as before at Paterson, N. J.

George S. Douglas, assistant head valuation engineer of the Bureau of Valuation of the Interstate Commerce Commission, has been appointed director of the bureau, succeeding **Robert A. Lacey,** who retired on June 30, after 31 years' service with the commission.

Engineering

M. S. Norris, field engineer on the Baltimore & Ohio at Pittsburgh, Pa., has been appointed assistant engineer at that point.

J. S. Knight, principal assistant engineer of the Baltimore & Ohio Chicago Terminal, at Chicago, has been promoted to assistant regional engineer, with the same headquarters.

O. A. C. Thorsen, assistant to the chief engineer of the New York, Susquehanna & Western, at Paterson, N. J., has been promoted to assistant chief engineer, with the same headquarters.

M. S. Miller, acting engineer maintenance of way of the Reading, at Philadelphia, Pa., has been promoted to engineer maintenance of way.

G. E. Corriveau, division engineer on the Canadian National, at Levis, Que., has been promoted to assistant district engineer, at Quebec, Que.

E. W. G. Champion, has been appointed engineer maintenance of way of the Atlantic region of the Canadian National, at Moncton, N.B.

L. A. Comeau, assistant engineer on the Canadian Pacific, at North Bay, Ont., has been promoted to division engineer of the Laurentian division, at Montreal, Que., succeeding **R. E. Farmer,** transferred.

Thomas D. Saunders, engineering assistant of the Temiskaming & Northern Ontario, has been promoted to chief engineer, at North Bay, Ont., succeeding **Sheldon B. Clement,** assigned to special duties.

W. N. Kramer, an instrumentman on the Illinois Central, has been promoted to assistant engineer, with headquarters as before at Clinton, Ill., succeeding **W. E. Russell,** who has retired.

S. B. Wass, division engineer of the Toronto Terminal division of the Canadian National, has been appointed assistant engineer on construction, with headquarters as before at Toronto, Ont.

A. P. Button, designing engineer of the New York Central, Lines West of Buffalo, has been promoted to assistant to the chief engineer, Lines West of Buffalo, succeeding **N. D. Hyde,** whose promotion to assistant to the vice-president is reported elsewhere in this issue. **H. F. Whitehead,** assistant designing engineer, at Chicago, has been advanced to designing engineer, replacing Mr. Button. Mr. Whitehead entered railway service in March, 1909, as a draftsman at New York, serving subsequently as assistant engineer and designer. In December, 1927, he was appointed chief draftsman on construction of the Cincinnati Union Terminal, at Cincinnati, Ohio, and in June, 1930, he was further advanced to assistant designing engineer. He returned to New York as assistant engineer in January, 1934, and six years later he was transferred in the same capacity to Chicago. In June, 1944, Mr. Whitehead was promoted to assistant designing engineer in the office of the chief engineer, at Chicago, remaining in this position until his recent appointment.

H. F. Whitehead

A. P. Button

Mr. Button was born at Schaghticoke, N.Y., on August 1, 1888, and received his higher education at Rensselaer Polytechnic Institute. He entered railway service in 1909 as rodman on the New York Central & Hudson River (now New York

Central), at Albany, N.Y. In 1910 he was promoted to draftsman, at Rome, N.Y., serving subesequently at Albany and New York. In 1916 he was advanced to engineer barge canal crossings, and two years later he became assistant engineer, New York. Mr. Button was made assistant engineer of tracks in 1919, and in 1920 he was appointed engineering assistant to the president. In 1922 he was transferred to Cleveland, Ohio, as engineering draftsman, later serving as assistant engineer and engineer of grade separations at that point from August, 1925, until October, 1939, when he was promoted to engineer of grade crossings, at Chicago. In January, 1944, Mr. Button was promoted to designing engineer at Chicago.

W. C. Pinschmidt, special engineer in the office of the vice-president of the Chesapeake & Ohio, has been promoted to engineering assistant to the vice-president, with headquarters as before at Cleveland, Ohio. Mr. Pinschmidt was born at Baltimore, Md., and entered railway service in the office of the chief engineer of the Baltimore & Ohio in that

W. C. Pinschmidt

city. After serving in various engineering capacities with the B. & O., and later with the Norfolk & Southern, at Norfolk, Va., he entered the employ of the C. & O. in 1923, as assistant engineer, maintenance of way department, at Richmond, Va. In March, 1933, he was transferred to the office of executive vice-president, at Cleveland, remaining in this position until April, 1943.

M. J. Hubbard, assistant division engineer on the Chesapeake & Ohio, has been promoted to division engineer, with headquarters as before at Columbus, Ohio, succeeding **C. F. Edwards,** who died recently.

R. C. Young, acting division engineer of the Louisville division of the Louisville & Nashville, at Louisville, Ky., has been promoted to division engineer with the same headquarters.

James B. Clark, assistant supervisor of bridges and buildings of the Birmingham division of the Louisville & Nashville, at Birmingham, Ala., has been promoted to assistant division engineer of that division, at Birmingham, succeeding **Walter E. Quinn,** whose promotion to assistant engineer, at Louisville, Ky., was reported in the June issue.

J. B. Hunley, whose appointment as consulting engineer of the New York Central, Lines West of Buffalo, was reported in the July issue, was born at Terre Haute, Ind., on August 12, 1881, and was

J. B. Hunley

graduated from the Rose Polytechnic Institute in 1903. In May, 1903, he entered railway service as an assistant engineer in the construction department of the Cleveland, Cincinnati, Chicago & St. Louis (part of the N.Y.C. System), and in 1905 he was promoted to assistant engineer in the chief engineer's office, later being advanced to office engineer. In 1915 he was promoted to engineer of bridges and structures of the Big Four, with headquarters at Cincinnati, Ohio, and in May, 1940, he was advanced to engineer of structures of the New York Central, Lines West of Buffalo, the position he held at the time of his new appointment.

George E. Robinson, whose promotion to engineer of structures of the New York Central, with headquarters at Chicago,

George E. Robinson

was reported in the July issue, was born on March 5, 1896, at Lowell, Mass. He attended Worcester Polytechnic Institute and in August, 1917, entered railway service with the Cleveland, Cincinnati, Chicago & St. Louis as a designer, with headquarters at Cincinnati, Ohio. After serving as a captain in the Engineers' Corps of the U. S. Army in World War I, Mr. Robinson returned to his former position in 1920. In 1921 he was advanced to assistant engineer at Springfield, Ohio, serving in that capacity at various points. In 1924, he went with the New York Central as assistant engineer, with headquarters at Cincinnati. He was promoted to assistant engineer of structures with the same headquarters in 1941, being transferred to Cleveland in 1943, and to Chicago in 1944, where he was located at the time of his recent appointment.

A. H. Henckel, assistant engineer on the Delaware, Lackawanna & Western, has been promoted to division engineer of the Morris and Essex division, with headquarters as before at Jersey City, N.J.

Guy P. Palmer, engineer maintenance and construction of the Baltimore & Ohio Chicago Terminal, at Chicago, has been promoted to regional engineer construction and maintenance, with the same headquarters. Mr. Palmer was born at Winchester, Mass., on March 29, 1883,

Guy P. Palmer

and is a graduate of Massachusetts Institute of Technology. He entered railway service on February 5, 1905, as an assistant on the engineering corps of the Baltimore & Ohio at Chicago, and in February, 1906, he was transferred to Newark, N.J., being transferred back to Chicago three months later. In 1909 Mr. Palmer was promoted to construction assistant at Chicago, and in 1910 he was advanced to assistant engineer, maintenance of way, with the same headquarters. One year later he was promoted to division engineer, also with headquarters at Chicago. In 1918 he was appointed engineer maintenance and construction of the B. & O. C. T., the position he held at the time of his new promotion.

W. Walkden, bridge engineer of the Western region of the Canadian National, at Winnipeg, Man., has retired after 38 years of railway service.

L. G. Curtis, chief engineer of the Baltimore & Ohio Chicago Terminal, with headquarters at Chicago, has retired after more than 50 years of service.

Alexander Manson, who was formerly employed as assistant engineer on the Louisville division of the Louisville &

Nashville, has returned as assistant engineer on the Birmingham division, at Birmingham, Ala., succeeding **N. C. Boogher,** whose promotion to assistant supervisor of bridges and buildings is reported elsewhere in these columns.

Thomas D. Cassady, a draftsman in the office of the chief engineer of the Louisville & Nashville, at Louisville, Ky., has been promoted to assistant engineer of the Knoxville and Atlanta division, at Knoxville, Tenn., succeeding **W. Tansil Dudley.** Mr. Dudley has been advanced to assistant engineer in the miscellaneous department, at Louisville, replacing **F. H. Boulton,** whose promotion to assistant supervisor of bridges and buildings is reported elsewhere in this issue.

David A. Ruhl, engineer of buildings of the Chicago, Rock Island & Pacific, at Chicago, has been promoted to superintendent in charge of maintenance and operations of the LaSalle St. Station, Chicago, a newly-created position. **T. J. Engle,** assistant engineer of buildings, has been advanced to engineer of buildings, succeeding Mr. Ruhl.

C. R. Montgomery, assistant division engineer of the Middle division of the Pennsylvania, at Altoona, Pa., has been promoted to division engineer of the Monongahela division, at Pittsburgh, Pa., succeeding **G. M. Hain,** who has resigned. **L. W. Green,** track supervisor on the Philadelphia Terminal division, at Philadelphia, Pa., has been advanced to assistant division engineer at Altoona, succeeding Mr. Montgomery.

Carl H. Vogt, whose promotion to division engineer of the Central division of the Central Railroad of New Jersey, at Jersey City, N.J., was reported in the June issue, was born on March 16, 1888, and attended Lehigh university, graduating in civil engineering in 1909. He entered railway service with the New York Central in July, 1909, as a member of the engineering corps. In August of the same year he became an assistant supervisor of track, and later served as an inspector at a steel mill. From January, 1914, to December, 1915, he served as an inspector at a creosoting plant. At the end of this period, Mr. Vogt became a bridge inspector, later being appointed assistant supervisor of bridges and buildings. In May, 1917, he became assistant division engineer, and in January, 1923, he became supervisor of track. On February 1, 1930, he went with the Jersey Central as supervisor of track at Jersey City, and on July 9, 1941, he was promoted to assistant division engineer of the Central division, which position he held until his recent promotion.

Carl H. Vogt

B. E. Widder, whose appointment as engineer of buildings of the Atlantic Coast Line, at Wilmington, N.C., was reported in the June issue, was born in Pennsylvania and attended Drexel Institute of Technology, at Philadelphia, Pa.

B. E. Widder

He entered railroading with the Atlantic Coast Line on May 24, 1917, and after serving with the United States Army from February, 1918, to May, 1919, he returned to railroad service with that company. Mr. Widder has been engaged in general design and architectural work for the Atlantic Coast Line from 1920 to the present, with the exception of brief period from December, 1926, to January, 1927, and was serving as an architect at the time of his recent appointment as engineer of buildings.

I. C. Brewer, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific, at LaCrosse, Wis., has been promoted to division engineer, with headquarters at Mason City, Iowa, succeeding **Walter Lakoski,** who has been transferred to LaCrosse. Mr. Lakoski relieves **E. W. Bolmgren,** who in turn has been transferred to Minneapolis, Minn., where he replaces **Art Daniels,** whose death on June 27 is reported elsewhere in these columns.

William J. Turner, principal assistant engineer of the Atlantic Coast Line, with headquarters at Wilmington, N.C., has been appointed engineer maintenance of way of the Southern division, with headquarters at Jacksonville, Fla., succeeding **D. M. Lamdin,** who has been appointed assistant to the chief engineer at Wilmington. A photograph and biography of Mr. Turner were published in the November, 1944, issue following his promotion to principal assistant engineer.

Morris W. Clark, whose promotion to office engineer of the Atlantic Coast Line, at Wilmington, N.C., was reported in the July issue, was born at Savannah on April 5, 1908, and attended the Citadel. He entered railway service on June 15, 1930, as a chainman on the Atlantic Coast Line at Wilmington, later being promoted successively to rodman, junior draftsman and senior draftsman at that point. On February 1, 1936, he was advanced to assistant supervisor of building repairs at Rocky Mount, N.C., and on February 16, 1936, he returned to Wilmington as junior engineer. Mr. Clark was appointed assistant engineer at Savannah on April 1, 1939, and was later advanced to office engineer and supervisor of building repairs at that point, holding the latter position until his recent promotion.

Track

J. G. Dail has been appointed roadmaster on the Atlantic Coast Line at Florence, S. C., succeeding **W. A. Andrews,** who retired from active duty on June 15.

Frank E. Dauner has been appointed acting roadmaster of the first track district of the Pacos division of the Atchison, Topeka & Santa Fe, at Clovis, N.M., succeeding **J. E. Emond,** who has been granted a leave of absence due to ill health.

W. W. Arnold has been appointed roadmaster on the Illinois division of the Missouri Pacific, at Murphysboro, Ill., succeeding **L. A. Baucom,** whose death is reported elsewhere in these columns.

B. Williamson, general track foreman on the Kentucky division of the Illinois Central, at Paducah, Ky., has been promoted to acting supervisor of track at Dyersburg, Tenn., succeeding **J. H. Dame,** who has been granted a leave of absence.

J. L. Vavra, extra gang foreman on the Chicago, Milwaukee, St. Paul & Pacific, at Tama, Ia., has been promoted to roadmaster, at Marion, Ia., succeeding **E. Schoech,** who has been transferred to Chillicothe, Mo., replacing **W. A. Moberly,** assigned to other duties.

Howard De Groat, a track foreman on the New York Central, has been promoted to assistant supervisor of track on the River division, with headquarters at Kingston, N.Y., succeeding **David De Groat,** who has retired because of ill health.

S. C. Jannotti, assistant supervisor of track on the New York zone of the Pennsylvania, at Jersey City, Pa., has been promoted to supervisor of track on the Central region, at Emporium, Pa., succeeding **I. S. Pringle,** deceased. **N. J. Padula,** general foreman of track on the Central region, at Niles, Ohio, has been advanced to assistant supervisor of track at Jersey City, replacing Mr. Jannotti.

LeRoy J. Shea, whose appointment as track supervisor on the Lehigh and Susquehana division of the Central Railroad of New Jersey, at Ashley, Pa., was reported in the June issue, was born at Tonawanda, N.Y., on September 28, 1899, and entered railway service on November 15, 1915, as a section laborer on the Rochester division of the New York Central. On December 1, 1923, he was promoted to extra

gang foreman at Otis, N.Y., and on September 1, 1927, he was advanced to general foreman at Medina, N.Y. Mr. Shea was promoted to assistant supervisor of track at Rochester, N.Y. on December 31, 1927, and on August 1, 1930, went with the Jersey Central as general foreman at Jersey City, N.J. On August 13, 1942, he was advanced to assistant supervisor of track at Ashley.

William S. Cooper, assistant track supervisor on the Boston & Maine, has been promoted to acting track supervisor on the Fitchburg division, with headquarters at Fitchburg, Mass., succeeding **James C. Shaw,** who has been transferred to Mechanicville, N.Y. Mr. Shaw replaces **Jeremiah F. McCarthy,** who died recently. **Angelo Baldassaro** has been appointed acting assistant track supervisor, succeeding Mr. Cooper.

A. S. Deaner, who has been serving in the armed forces of the United States, has returned and has been appointed track supervisor on the Cleveland division of the Pennsylvania, at Cleveland, Ohio, succeeding **J. M. Minturn,** who has been transferred to the Philadelphia Terminal division, at Philadelphia, Pa. Mr. Minturn replaces **L. W. Green,** whose promotion to assistant division engineer is reported elsewhere in these columns.

A. E. Himler, assistant supervisor of track on the Chicago Terminal division of the Pennsylvania, has been promoted to supervisor of track on the Panhandle division, with headquarters at Carnegie, Pa., succeeding **G. A. Sargent, Jr.,** who has been transferred to the Buffalo division at Olean, N.Y. Mr. Sargent replaces **A. M. Kennedy, Jr.,** who has been transferred to the Eastern division at Alliance, Ohio, relieving **R. L. Chaney,** who has been appointed supervisor—special duty, Eastern Ohio division. **C. L. Towle,** supervisor of track, Pennsylvania-Reading Seashore Lines, at Camden, N.J., has been transferred to the Central region, Panhandle division.

Emil Gordon, whose promotion to general supervisor maintenance of way of the Eastern lines of the Canadian Pacific, was reported in the June issue, entered railroad service in 1909 during the construction of the Grand Trunk Pacific (now part of the Canadian National) near Edmonton, Alta. In 1912, he entered the employ of the Canadian Pacific as a section man at Lacombe, Alta. After serving in various capacities, he was advanced to roadmaster at Medicine Hat, Alta., in 1926, later being transferred to Perth.

Millard M. Bodenmiller, whose promotion to supervisor of track of the Cleveland, Cincinnati, Chicago & St. Louis (Big Four), at Galion, Ohio, was reported in the June issue, was born in Shelby County, Ohio, on July 2, 1904, was educated in the public schools of Houston, Ohio, and entered railway service with the Big Four on November 1, 1924, as a section laborer at Houston. He was promoted to section foreman on June 1, 1926, serving subsequently as extra-gang foreman and general foreman until November, 1943, when he was further advanced to assistant supervisor of track, the position he held at the time of his recent promotion.

Stanley L. Furry, whose promotion to supervisor of track on the Cleveland, Cincinnati, Chicago & St. Louis (Big Four), at Galion, Ohio, was reported in the June issue, was born at Loxa, Ill., on October 24, 1913, and, after a high school education, entered railway service as a section laborer on the Big Four at Loxa, in January, 1933. In May, 1939, Mr. Furry was appointed section foreman at Tower Hill, Ill., and in 1941 he was advanced to extra-gang foreman on the Ohio division, with headquarters at Indianapolis, Ind. In November, 1943, he was promoted to assistant supervisor of track at Galion, Ohio, remaining in this position until his recent appointment.

J. H. Barksdale, whose promotion to supervisor of track on the Chesapeake & Ohio, with headquarters at St. Albans, W. Va., was reported in the July issue, was born at Halifax, Va., on September 20, 1907, and attended Hampden-Sidney and the University of Virginia. He entered railway service on September 1, 1928, as a chainman in the system engineering corps of the C. & O., at Richmond, Va., later being advanced to rodman and instrumentman at that point. In March, 1941, Mr. Barksdale was appointed assistant cost engineer at Ashland, Ky., and two years later he was transferred to Pikeville, Ky. In October, 1944, he was promoted to assistant supervisor of track at Chillicothe, Ohio, which position he held until his recent promotion.

Bridge and Building

Edward Holmes, assistant master carpenter on the Erie, at Jersey City, N.J., has been promoted to master carpenter at Hornell, N.Y., succeeding **Roy Pierce,** who retired on July 1 because of ill health.

Nicholas C. Boogher, assistant engineer of the Birmingham division of the Louisville & Nashville, has been promoted to assistant supervisor of bridges and buildings of that division, with headquarters as before at Birmingham, Ala., succeeding **James B. Clark,** whose promotion to assistant division engineer is reported elsewhere in these columns.

Frederick H. Boulton, assistant engineer in the miscellaneous department of the Louisville & Nashville, has been promoted to assistant supervisor of bridges and buildings of the Louisville division, with headquarters as before at Louisville, Ky., succeeding **R. L. Samuell, Jr.,** whose promotion to assistant division engineer of that division was reported in the March issue.

G. W. Carbaugh, whose promotion to supervisor of bridges and buildings of the Radford division of the Norfolk & Western, at Roanoke, Va., was reported in the June issue, entered N. & W. service in December, 1918, as a carpenter on the Pocahontas division, later serving successively as assistant carpenter foreman, carpenter foreman at Bluefield, W. Va., and bridge inspector in the engineering department. In October, 1938, he was promoted to assistant supervisor of bridges and buildings on the Pocahontas division, at Bluefield, and in September, 1942, he was advanced to acting supervisor of bridges and buildings on the Norfolk division, with headquarters at Crewe, Va. Mr. Carbaugh was later appointed assistant supervisor of bridges and buildings on the Shenandoah division, which position he held until his recent promotion.

N. I. Huntley, Jr., assistant master carpenter of the New York division of the Pennsylvania, at Jersey City, N.J., has been promoted to master carpenter of the St. Louis division, at Terre Haute, Ind., succeeding **H. R. Morris,** who has been assigned to special duties because of ill health. **David McKibben,** a carpenter foreman on the Monongahela division, has been advanced to assistant master carpenter at Jersey City, relieving Mr. Huntley.

Water Service

W. R. Orange has been appointed supervisor of water supply of the Richmond division of the Chesapeake & Ohio, at Richmond, Va., succeeding **R. M. Johnson,** who has retired. **Noah Newsom** has been appointed supervisor of water supply of the Russell terminal, at Russell, Ky., a newly created position.

Special

M. Wells has been appointed tie, timber and steel agent of the Rapid City, Black Hills & Western, with headquarters at Dallas, Tex.

Obituary

C. F. Edwards, division engineer on the Chesapeake & Ohio, at Columbus, Ohio, died recently.

L. A. Baucom, roadmaster on the Illinois division of the Missouri Pacific, at Murphysboro, Ill., died on May 29.

Art Daniels, division engineer on the Chicago, Milwaukee, St. Paul & Pacific, at Minneapolis, Minn., died in that city on June 27.

Marion Jay Parr, superintendent of the Savannah division of the Central of Georgia, at Savannah, Ga., died recently after a long illness.

James A. Peabody, who retired in 1935 as engineer maintenance of way of the Chicago & North Western, with headquarters at Chicago, died at his home in that city on July 10.

Henry H. Garrigues, an engineer by training and experience, who retired on February 1 as assistant to the general manager of the Eastern region of the Pennsylvania, with headquarters at Philadelphia, Pa., died on July 15 at his home in Radnor, Pa.

W. F. Rech, bridge and building engineer of the Alton, died at his home in Chicago on July 24 after a long illness. Mr. Rech was named bridge engineer of the Chicago & Alton in 1918, holding that position with the C. & A. and its successor, the Alton, continuously from that date until his death.

Association News

Maintenance of Way Club of Chicago

At a brief meeting of the Executive committee on July 9, consideration was given to the appointments to be made to the standing committees, programs and to other club matters, looking to a most interesting and helpful season beginning with the first meeting in the fall on October 22.

American Railway Engineering Association

During July there was only one committee meeting, this being that of the Committee on Water Service, Fire Protection and Sanitation, which was held at Chicago on July 17, with 30 members in attendance. So far, no meetings have been scheduled for August.

Indications are that the Proceedings for 1945 will be mailed to members before the middle of August. The 1945 Annual Supplement to the Manual was mailed to members early in July.

Bridge and Building Association

On July 16 the Executive committee, together with a number of past-presidents, met in Chicago and reviewed in detail five of the eight technical committee reports to be presented before the restricted one-day annual meting of the association to be held at the Hotel Stevens, Chicago, on October 17. The other three committee reports will be reviewed by a specially appointed reviewing committee selected from members in the Chicago area prior to their presentation at the annual meeting.

While attendance at the annual meeting will, of necessity, be restricted largely to the officers, directors, technical committee chairmen and members within the Chicago area, an intensive one-day program is planned, which will include the election of officers for the ensuing year.

Roadmasters' Association

The Executive committee of the association met in Chicago on July 10, and, following detailed consideration of many routine association matters, one of the most important of which was the making of preliminary plans for the one-day restricted annual meeting to be held in Chicago on September 12, it reviewed tentative drafts of all five technical committee reports to be presented before this meeting.

The annual meeting, which will be held at the Hotel Stevens, will, of necessity, be restricted to the officers, committee chairmen and members within the Chicago area. However, a report of the meeting, including all of the committee reports, will be published in the October issue of *Railway Engineering and Maintenance*, and reprints of this section of the October issue will be mailed to all members.

Wood-Preservers Association

At a meeting of the Executive committee held in Chicago on July 10, the appointment of chairmen for the following committees was announced:

Preservatives, R. H. Baechler, chemist, Forest Products Laboratory, Madison, Wis.; Pressure Treatment of Oak Ties and Lumber, P. D. Brentlinger, resident inspector, Pennsylvania, Philadelphia, Pa.; Pressure Treatment of Southern Pine Ties and Lumber, E. H. Moore, general superintendent, International Creosoting & Construction Co., Texarkana, Tex.; Pressure Treatment of Poles, W. R. Yeager, inspection engineer, Western Electric Co., Inc., New York; Inspection, H. F. Round, Pennsylvania, Philadelphia, Pa.; Tie Service Records, W. J. Burton, assistant to chief engineer, Missouri Pacific, St. Louis, Mo.; Bridge and Structural Timber, T. H. Strate, division engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago; Marine Pile Service Records, A. S. Daniels, superintendent, wood preserving plant, Texas & New Orleans, Houston, Tex.; Post Service Records, J. O. Blew, Forest Products Laboratory, Madison, Wis.; Diversified Uses of Treated Wood, Leonard Perez, district sales manager, wood preserving division, Koppers Company, St. Louis, Mo.; Uses of Treated Wood for Car Lumber, H. R. Condon, vice-president, Wood Preserving division, Koppers Company, Pittsburgh, Pa.; Pressure Treated Foundation Piles, W. A. Stacey, engineer, Service Bureau, American Wood-Preservers' Association, Lawrence, Kan.; Fireproofing, R. H. Mann, engineer, Service Bureau, American Wood-Preservers' Association, New York; Special Committee on the Painting of Creosoted Wood, J. G. Segelken, engineer, Bell Telephone Laboratories, New York; Special Committee on Treated Wood Blocks, A. W. Cobley, president, Hicks-Cobley, Inc., Toledo, Ohio; Special Committee on Preservative and Fire Retardant Treatments of Laminated Members (Plywood and Glued-up Fabrication), D. L. Lindsley, J. H. Baxter & Co., Los Angeles, Cal.; and Service Bureau Board, H. R. Condon.

Mail balloting has been completed on all of the tentative standards that were offered for adoption at the recent "Meeting by Mail" of the association and all of these standards were approved overwhelmingly. These proposals included one new standard covering creosote-petroleum solutions, and the continuation or return to the tentative standing of eight standards and tentative standards that had been adopted previously, but to which certain revisions were recommended by the appropriate committees. The deletion from the Manual of two existing standards that had become obsolete by reason of improvements in treatment procedure, was also approved.

All of the 12 district chairmen of the committee recently appointed to study and develop more efficient methods for handling forest products have now been chosen and most of the district committees have held meetings, the latest being that of District 7, which was held in Chicago on July 10.

Some of the committees have already completed their surveys of mechanical-handling equipment now in use in their districts and are preparing their reports on this phase of the study. General Chairman A. E. Larkin expects to hold a meeting of the general committee at Chicago in the near future.

Supply Trade News

General

Templeton-Kenly & Co., Chicago, has been granted the Army-Navy "E" award.

The **Mall Tool Company,** Chicago, has been granted a fourth renewal of its Army-Navy "E" award.

The John N. Thorp Company, 50 Church Street, New York 7, has been appointed eastern sales representative of the **Woolery Machine Company,** Minneapolis, Minn.

The plant of the Columbus Creosoting Company, Columbus, Ind., has been purchased by Gillis & Company and Sherman H. Berry, and will be rehabilitated and placed in operation as the **Hoosier Creosoting Company. Hearl McGuire,** formerly treating inspector of the Chicago, Milwaukee, St. Paul & Pacific, at Granville, Wis., has been appointed manager of the new concern. Railroad ties are expected to constitute the bulk of the material to be treated.

Personal

David H. Scott has been appointed export sales manager of the **Oliver Iron and Steel Corporation,** Pittsburgh, Pa., with headquarters at 50 Church Street, New York.

Harold K. Wilson has been named southwestern representative of the **Douglas Fir Plywood Association,** with offices in the Chamber of Commerce building, Los Angeles, Cal.

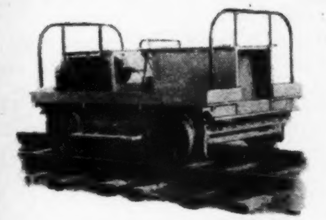
W. O. Bates, Jr., vice-president of the **Caterpillar Tractor Co.,** Peoria, Ill., has moved his office to San Leandro, Cal., where he assumes full-time administrative responsibilities as manager of the Caterpillar offices and plant at that point.

Harry A. Feldbush, works manager of the Holyoke, Mass., plant of the **Worthington Pump and Machinery Corp.,** Harrison, N. J., has been elected vice-president in charge of engineering for the entire corporation, with headquarters at Harrison. **Ralph M. Watson,** chief engineer of the Centrifugal Engineering division, has been appointed assistant to Mr. Feldbush.

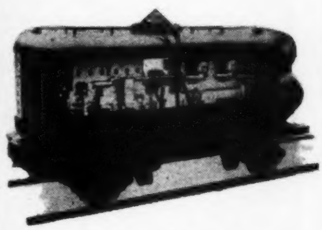
Harold H. Morgan, chief engineer and manager of the rail and fastenings department of the **Robert W. Hunt Company,** Chicago, has been elected vice-president and chief engineer, with the same headquarters, and **J. R. Mooney,** assistant manager, rail and fastenings de-

(Continued on page 800)

6 Schramm Compressors *For* Better Track Maintenance



Self-Propelled Rail Car

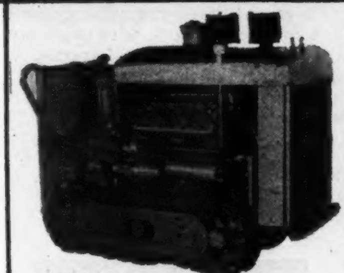


Rail Car Mounted

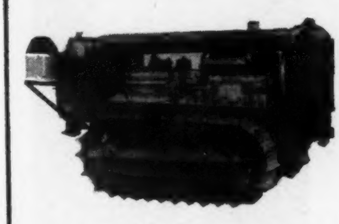
Crawler Mounted

Of varying capacity, all have the famous SCHRAMM liquid cooling, cam-operated intake, and high dependability. Select your next air compressor from this comprehensive SCHRAMM line; you will be better satisfied.

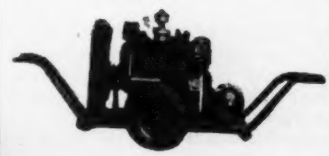
The right compressor for your track maintenance requirements can be found among the many SCHRAMM models, six of which are illustrated here. Two have flanged wheels; three are off-track crawlers, while the sixth is a hand-pushed trailer which may also be equipped with flanged wheels instead of the tires as shown.



No. 60 Crawler Type



Tractor Mounted



No. 60 Tampair

SCHRAMM, INC. THE COMPRESSOR PEOPLE WEST CHESTER, PA.

partment, Chicago, has been promoted to manager of that department, with the same headquarters. **L. J. Gill,** assistant manager of the cement and concrete department, at Chicago, has been promoted to manager of that department, with headquarters as before at Chicago.

W. C. Cheek, assistant district manager of the Chicago district of the Worthington Pump & Machinery Corporation, with headquarters at Chicago, has been promoted to district manager of the Chicago district, succeeding **W. A. Frazier,** who has been appointed European director of sales for the company, with headquarters at Paris, France. **Jack Laramie,** sales representative of the company at Chicago, has been promoted to assistant district manager of the Chicago district.

W. H. Tudor has been assigned to the Industrial Power division of the **International Harvester Company,** Chicago, Ill., as field application engineer. In his

W. H. Tudor

new position Mr. Tudor will co-operate with the railroads in developing the use of crawler tractors, wheel tractors and power units in off-track construction and maintenance-of-way work. Mr. Tudor's headquarters will be at 180 North Michigan Ave., Chicago.

Elmer J. Steger, manager of the Pneumatic Tool Division of the **Cleveland Pneumatic Tool Company,** Cleveland, Ohio, has been promoted to sales manager of the Pneumatic Tool and Rock Drill Divisions of that company.

W. P. Greenawalt, who has been on active duty in the United States Naval Reserve, has returned to civilian status and has resumed his former position as a partner in the firm of **Young & Greenawalt,** Chicago. Mr. Greenawalt served as a commander in the Civil Engineering Corps, and acted as commanding officer of the 81st Naval Construction Battalion, Seabees, during the construction of 12 naval bases in the United Kingdom. During the Normandy invasion, Mr. Greenawalt was in charge of Rhino Ferry operations, beach salvage and beach camp construction and maintenance for Utah beach. He was awarded the Legion of Merit by the U. S. Navy and the Croix de Guerre with Red Star by the French Republic.

Fred W. Deutsch, whose appointment as assistant sales manager of **Builders-Providence, Inc.,** Providence, R.I., was reported in the July issue, was born in New

Fred W. Deutsch

York and was educated at Stevens Institute. He was employed by the Permutit Company for several years and later by the Duro Pump Company. In 1943, he entered the employ of the Everson Manufacturing Company, becoming vice-president in 1943 and continuing in that position until his resignation early in this year.

John D. Tully has been appointed manager of sales, rails and accessories, of the **Bethlehem Steel Company,** at Bethlehem, Pa., succeeding **John W. Murphy,** whose death on June 24 is reported elsewhere in these columns. Following a short period, ending in June, 1925, during which he served in the frog and switch department, Mr. Tully has been employed continuously by the Bethlehem Steel Company in its

John D. Tully

New York office. **Murray A. Vickers,** of the company's Cleveland, Ohio, office, has been transferred to New York, replacing Mr. Tully.

The **Crane Company** has announced the following changes in its sales and branch house division: **Carter T. Pollock,** formerly manager of Crane's Chicago branch, has been appointed manager of the Central district, with headquarters in Chicago; and **W. A. Burbine,** manager of the Cleveland, Ohio, branch, has been appointed manager of the Chicago branch. **A. N. Rosborough,** manager of the Toledo, Ohio, branch, succeeds Mr. Burbine at Cleveland; **W. D. LaRue,** manager of the Muncie, Ind., branch succeeds Mr. Rosborough at Toledo; and **R. C. Danielson,** manager of the plumbing department at the Indianapolis branch, succeeds Mr. LaRue at Muncie.

Obituary

John W. Murphy, manager of sales, rails and accessories, of the Bethlehem Steel Company, died suddenly of a heart attack on June 24, at Bethlehem, Pennsylvania.

Myron J. Czarniecki, vice-president in charge of sales of the A. M. Byers Company, whose death at Pittsburgh, Pa., on June 18, was reported in the July issue, entered the employ of the Byers company in 1913, becoming manager of the company's Chicago sales office in 1919. In

Myron J. Czarniecki

1925 he became assistant general manager of sales, at Pittsburgh, and in 1930 he was advanced to general manager of sales. He was elected vice-president in charge of sales in 1934.

All-Purpose Welded Dippers—A 32-page booklet published by the Pettibone Mulliken Corporation, Chicago, describes in detail its line of all-purpose welded dippers, and also contains many illustrations, drawings and specifications of these dippers.

Surfacing with Tarmac.—The Koppers Company, Inc., Tar and Chemical Division, Pittsburgh, Pa., has published a 16-page brochure entitled "Surfacing with Tarmac", which describes 14 types of paving treatment. Advantages of each type of treatment are discussed, together with methods of application and tables showing Tarmac and standard road tar designations, applications, temperatures and uses, as well as recommended aggregate gradation. Among the methods discussed are the soil stabilized base course, the double surface treatment with cold and hot applications, prime coating, drag leveling course, mulch treatment, E-Z mix, road mixes, retreatments and seal coats, penetration macadam and hot-lay tar concrete.

3 *Reasons Why*
STONHARD RESURFACER
Solves Floor Problems

1 PATCHING . . .

Ease of application makes STONHARD RESURFACER particularly valuable for patching ruts, holes and breaks in floors.

BECAUSE: Stonhard Resurfacer *does away with heating of materials and chopping up the old surface.*

2 TRUCKING SURFACES . . .

STONHARD RESURFACER can be laid down *where it is needed most,* where trucking is heaviest. *Stonhard Resurfacer* proves most beneficial here as it actually improves with heavy trucking traffic.

BECAUSE: Stonhard Resurfacer *forms a hard, tough, yet resilient surface.*

3 COMPLETE FLOOR RESURFACING . . .

Its excellent, enduring and elastic qualities make complete overlays with STONHARD RESURFACER ideal not only for existing surfaces, but also for new construction as well.

BECAUSE: Stonhard Resurfacer *is easy and economical to apply . . . does not require skilled labor.*

STONHARD RESURFACER CAN BE APPLIED OVER ANY TYPE OF FLOOR
Concrete, Wood, Brick or Composition

TRIAL OFFER

A drum of STONHARD RESURFACER will be sent on trial to any responsible firm or institution. Test its performance for 30 days under actual working conditions. If not satisfactory, we will cancel our invoice.

STONHARD COMPANY
Building Maintenance Materials

Serving the Railroads, Utilities and Industries Since 1922

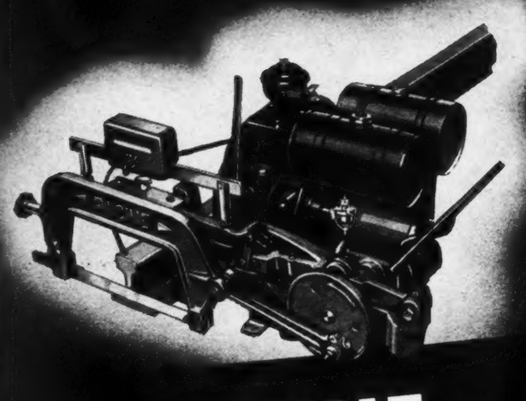
401 N. BROAD ST., PHILADELPHIA 8, PA

Write for
FREE FOLDER
"No Need for Floor Sculpture"
No Obligation

STONHARD COMPANY
1323 Callowhill Street
Philadelphia 8, Pa.

Please send us more detailed information on STONHARD RESURFACER.

FIRM..........
ADDRESS..........
MR..........TITLE..........
CITY..........ZONE.......STATE..........



RACINE
High Speed-Portable
RAIL CUTTERS

NOW MORE NECESSARY THAN EVER

Because Racine Rail Cutters do a faster, more accurate rail cutting job with less help and at lower cost, they are the choice of maintenance-of-way departments of leading railroads.

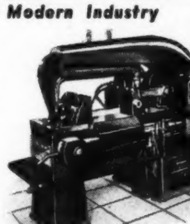
Now you can crop and fit rails right on the track without causing traffic delays. Here is a lightweight portable rail cutter that can be operated by *just one man.* Cuts fast, smoothly and accurately. Sawing the rail eliminates tiny fractures that may lead to dangerous rail failure.

Racine Rail Cutters are used wherever track work is to be done. Ideal for frog and switch work, at interlocking and reclamation plants and in terminals.

The standard model will cut rail 7⅜" high by 6¾" wide; extra capacity model will cut 10" high by 6¾" wide rails. Available with either gasoline engine, electric or air motors. A copy of Bulletin 58-A with complete details is yours for the asking. Address Racine Tool and Machine Company, 1738 State Street, Racine, Wisconsin.

RACINE METAL CUTTING MACHINES
The Production Saws of Modern Industry

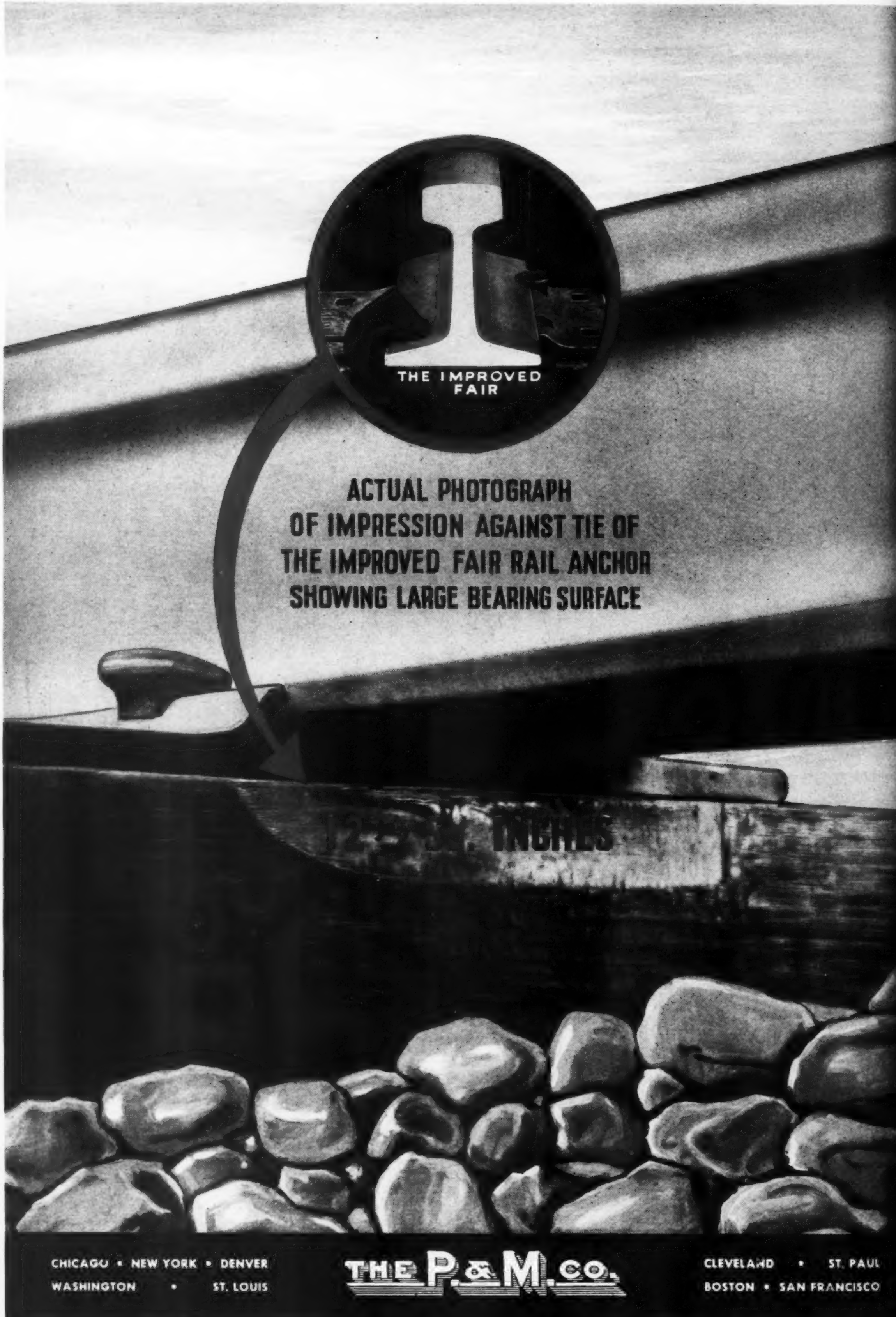
We manufacture a complete line of metal saws for cutting any metal. Available are models for high speed production and general shop work. Capacities 6"x6" to 20"x20". Each model is equipped with the most simple and latest operating and control devices for fast, accurate metal cutting. Catalog No. 12 illustrates and describes our complete saw line. Write for your copy.



STANDARD FOR QUALITY AND PRECISION
RACINE
RACINE TOOL and MACHINE CO.

RACINE

ALPHABETICAL INDEX TO ADVERTISERS


THE IMPROVED FAIR
ACTUAL PHOTOGRAPH
OF IMPRESSION AGAINST TIE OF
THE IMPROVED FAIR RAIL ANCHOR
SHOWING LARGE BEARING SURFACE
CHICAGO • NEW YORK • DENVER
WASHINGTON • ST. LOUIS
THE P. & M. CO.
CLEVELAND • ST. PAUL
BOSTON • SAN FRANCISCO